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Rock Products

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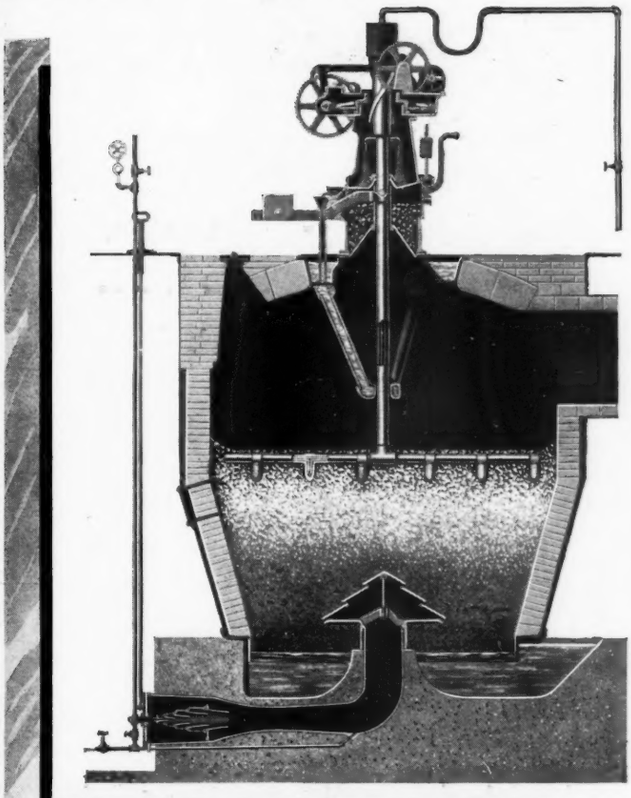
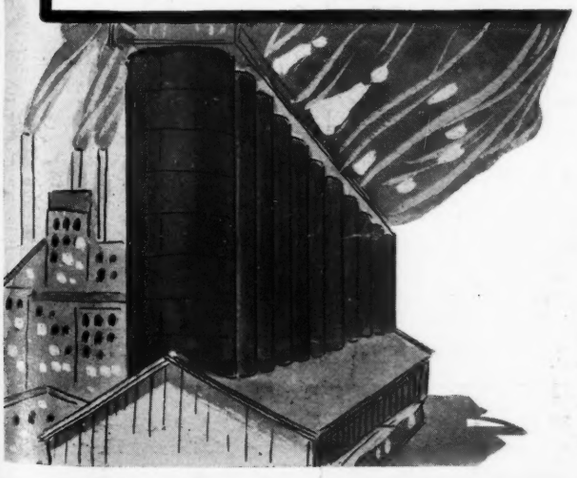




PRODUCE MORE LIME AT LESS COST BY

Installing As Additional Equipment

CHAPMAN GAS PRODUCERS

With Floating Agitator and Automatic Feed

The Chapman Agitator Producer is not a school-boy invention. Instead, it is a developed idea; built up through twenty years of experience; built by a man who knows the lime-burning game; a man who is a recognized authority on lime kilns.

It is marketed by an organization of trained, experienced engineers, and business men whose only interest is gas producers.

No wonder then that more lime is produced when Chapman Agitator Producers are used; no wonder that the lime is of a better quality; no wonder that more lime is produced per pound of coal. *Write us about your fuel problems.*

Chapman Engineering Co.
Mount Vernon, Ohio, U. S. A.

IMPROVED

Keystone Kilns

We have recently put on the market the "Improved Keystone Kiln" after having given it a successful tryout that has convinced us that it is a great improvement over the shaft kiln both in operation and construction.

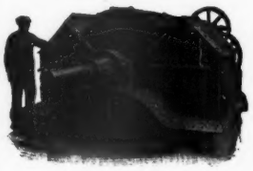
Lime plant producers should lose no time in getting in touch with this new model. The 225' "Keystone" Old Style Kilns can be fitted with improvements which will bring them up-to-date. This change will involve a minimum expense considering the increased output.

Every lime operator should now install a hydrating plant. Your profits will show big increases when we fit a hydrating plant to your present lime burning plant.

Write us today for further information

Steacy-Schmidt Mfg. Co.
York, Pennsylvania

"PENNSYLVANIA" Hammer Crushers

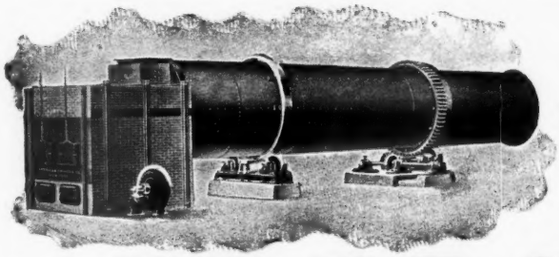


For Crushing and Pulverizing Lime, Limestone, Gypsum, Marl, Shale, Etc. Main Frame of Steel, "Ball and Socket" Self Aligning Bearings; forged Steel Shaft; Steel Wear Liners; Cage adjustable by hand wheel while Crusher is running. No other hammer Crusher has such a big Safety Factor.

PATENTED

Pennsylvania Crusher Company

New York PHILADELPHIA Pittsburgh



DRYERS

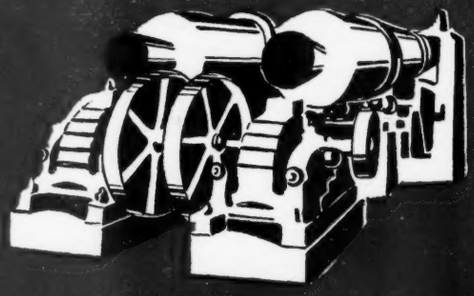
AMERICAN PROCESS CO. 68 Williams Street NEW YORK CITY

ATTENTION

Cement Manufacturers and Supply Dealers

Some of our customers who are using our Puncture and Waterproof bags report one-third increased sales to their satisfied customers. Also report breakage for 1917 and 1918 from all causes only one-half of one per cent.

THE JAITE CO.
JAITE, OHIO
Sole Manufacturers



1000 In Use—24% On Repeat Orders

That's a good enough record to win over any skeptic, isn't it? It proves at once both the widespread use and the merit of

RUGGLES-COLES DRYERS

They're built to dry at lowest ultimate cost. Run steadily twenty-four hours per day, year in and year out.

We will be pleased to answer any of your drying problems. We are in business not only to sell but to serve.

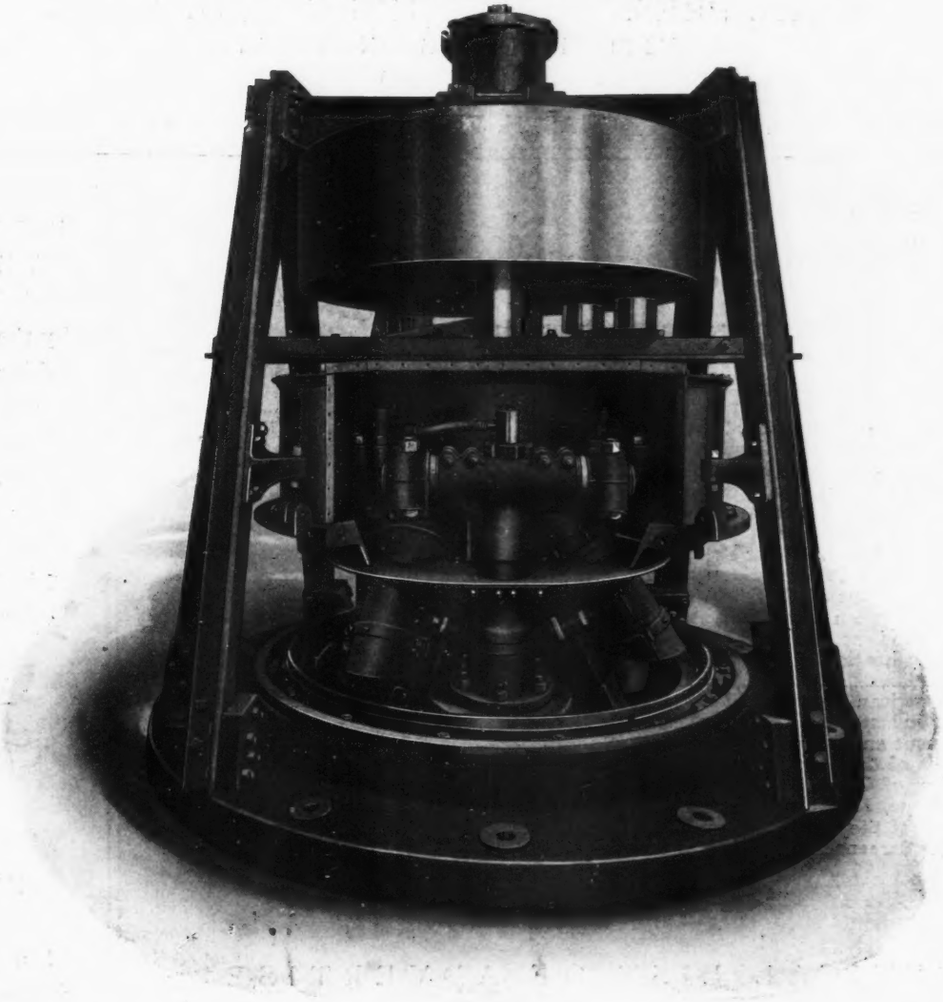
RUGGLES-COLES ENGINEERING CO.
50 Church St. Works: 332 S. Michigan Ave.
New York City York, Penna. Chicago, Ill.

For better service say, "I saw it in ROCK PRODUCTS"

The Bradley Hercules Mill

In October Another Large Pennsylvania Cement Company Adopted This Mill As a Preliminary Pulverizer of Clinker

Watch Next Issue for November Announcement



Investigation means purchasing, as no other mill has ever equalled this mill's performance as to low horsepower consumption, low maintenance cost and large output, with an extremely fine product that increases the output of any tube mill.

It's a Great Labor and Money Saver

Let us send our engineer to show how these mills will fit in with your present tube mill installation and reduce your cost of manufacture and relieve your labor situation.

Bradley Pulverizer Company, Boston, Massachusetts
Works: Allentown, Pennsylvania

MANUFACTURERS OF THE GIANT GRIFFIN MILL

Saying, "I saw it in ROCK PRODUCTS," will bring quick action

Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor CHAS. H. FULLER, Manager C. F. TREFZ, Associate Editor

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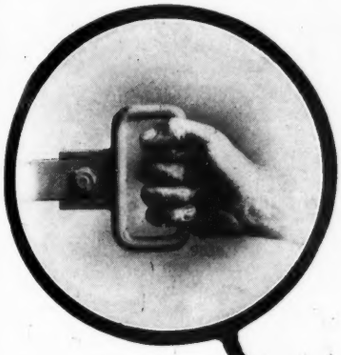


A Simple Push of the Lever of the

JEFFREY

Self-Propelling Loader

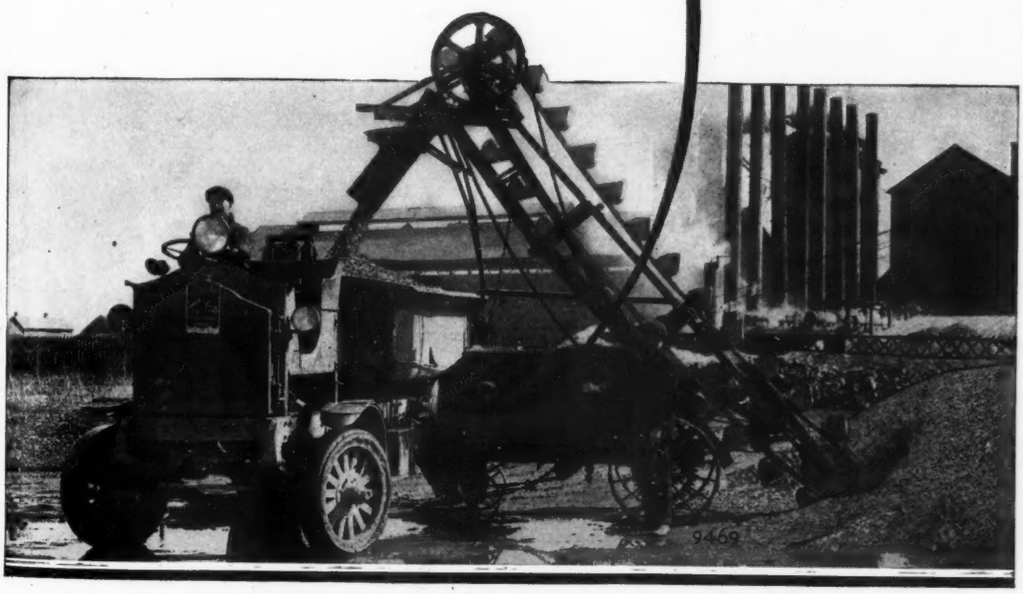
starts the buckets digging into the material, carrying it up and emptying it into your wagons and trucks.

Some Other Reasons Why the Jeffrey Self-Propelling Loader Is a Profitable Machine for Road Contractors, Building Supply and Coal Dealers, Manufacturers and Others:

1. Saves from 5 to 10 men and more loading accomplished.
2. Efficiency of teams and trucks increased.
3. Less confusion and men made more contented.
4. Men relieved of back-breaking drudgery and enabled to go on easier and more productive work.
5. Every Jeffrey Loader pays for itself within a few months.

The Jeffrey Loader is just as easy to operate as your automobile. All the operating levers are placed on one side of the loader, so that one man (an ordinary yard laborer) can readily start the elevator to load, or can move the machine further into the pile under its own power. To move to another pile, he throws in the reverse, backs up, and moves the loader to a more advantageous position.

Complete details of the Jeffrey Loader, and interesting letters telling what other users think of it, are found in Catalog No. 177-D. Send for copy.



Loading a 7-ton Sterling Truck with Sand in six to eight minutes with a Jeffrey Self-Propelling Loader

The Jeffrey Mfg. Co.

935 North Fourth Street

Columbus, O.

BRANCHES:

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Cleveland
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St. Louis
Birmingham
Dallas
Milwaukee
Seattle
Denver
Montreal
Detroit

Handle it Mechanically

This new screen the MITCHELL Electric Vibrating Screen

delivers more than 1200 tons per 24 hours of minus 1/2" material

Actual installation of four Mitchell Electric Vibrating Screens in one of the world's largest concentrating mills, delivering a screened product of over 5000 tons per 24 hours.

The Mitchell Electric Vibrating Screen has been in actual operation in one of the world's largest concentrating mills for nearly two years. And through an application of mechanical principles that are revolutionary it is daily demonstrating its superiority over other types of screens.

With a strong, persistent UPWARD and ROTARY movement, induced by electric power applied from beneath the screen, the Mitchell produces 3,600 vibrations of the screen cloth per minute, without the slightest straining of the mechanism. It can classify AT A LESS COST a far greater quantity of material in a given length of time with a given capacity, than any other screen made.

Capacities in Actual Operation

The following capacities daily delivered by the Mitchell in the big installation illustrated above bear out this statement:

In coarse crushing work each Mitchell screen is delivering a screened product of more than 1200 tons per 24 hours of minus ½" material.

In fine crushing, dry work, each Mitchell is delivering a screened product of more than 600 tons per 24 hours of minus 10 mesh material.

In fine crushing, wet work, each Mitchell is delivering a screened product of more than 750 tons per 24 hours of minus 10 mesh material.

The Mitchell is designed for the classification of any crystalline or granular material. The unequalled capacities it delivers in ore screening are indicative of what it will do with sand, gravel, limestone, fertilizer, and other rock products.

We shall be glad to send at your request an illustrated booklet, giving a detailed description of the Mitchell Electric Vibrating Screen.

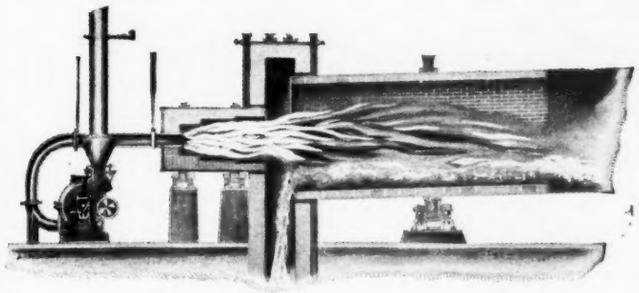
STIMPSON EQUIPMENT COMPANY

Manufacturers and Sole Agents

315 Felt Building **Salt Lake City, Utah**

Pulverized Coal

For Drying and Calcining



Low Temperature Dryer with Ignition Chamber

Reduces Operating Cost

Improves the Quality of the Product

Increases the Output

The Aero Pulverizer

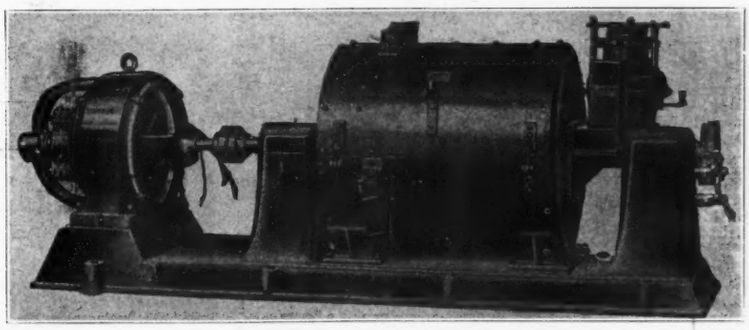
reduces operating cost all along the line—in the original installation, in the interest charges, in the upkeep, in labor. There is no waste, no CO in the flue gases, no smoke, no loss of carbon in the ash, no raking or covering the fire with fresh coal, no open doors to cool the fire. Slack coal can be used at low cost.

It improves the quality of the output because the temperature produced is always under positive control and may be kept uniform, therefore allowing no overburning. The flame may be shortened or elongated, made oxidizing, reducing or neutral at the will of the operator. This results from definite control over the quantity and quality of the mixture of coal and air which are delivered from the machine to the furnace.

The large volume of gas, its rapid passage through the charge under pressure, with no cooling of fires from raking, stoking or open doors, always the maximum permissible temperature under easy and definite control, will increase the output from 20% to 50%.

The Aero Pulverizer is simple, compact and hardy. Made in five standard sizes, ranging in capacity from 600 lbs. to 5000 lbs. of coal per hour. The cut below shows our 3000-lb. machine direct-connected to a motor—a complete powdered coal plant.

BACKED BY THE LONGEST SUCCESSFUL SERVICE OF ANY PULVERIZED COAL EQUIPMENT



THE AERO PULVERIZER CO. Room 1441 120 Broadway NEW YORK

The advertiser wants to know that you saw his ad in ROCK PRODUCTS

The Telsmith Bolt-Shaft Breaker

—Watch It Eat Rock

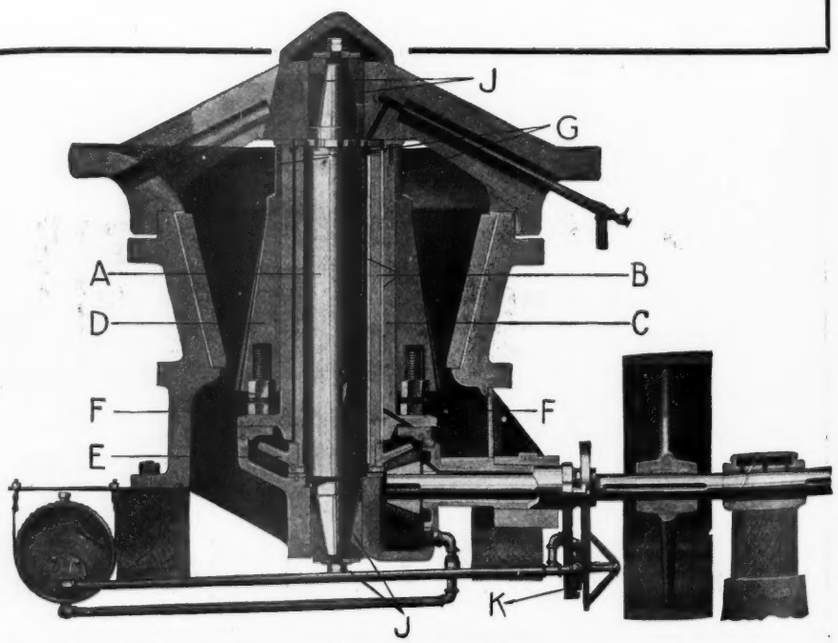
The one big fundamental advantage of the Telsmith Primary Breaker is the parallel crushing stroke. Telsmith exerts the **full stroke** on the big lumps just as they enter the bowl. The initial bite is a long, horizontal, bull-dog grip that doesn't let go. It just fairly eats into the rock, increasing the capacity, reducing the labor in the quarry and over the crusher. But there are other things which have assisted the Telsmith Breaker to its predominant standing in the coarse crusher field. For instance:—

While the **width** of the opening is the same, as in other gyratory crushers, in every other dimension of the concave bowl, crushing cone and feed openings, Telsmith is 25-35 per cent bigger than other crushers. Don't take our word for it, but measure up the machines. When you have done that, you'll not be surprised to find Telsmith doing such splendid work for Charles Warner Co. Wilmington Del., United Railways Co. St. Louis Mo., Storey Rock Co. Bozeman Mont., Thomas Iron Co. Wharton N. J., Defrain Sand Co. Philadelphia Pa., Thomasville Stone & Lime Co. Thomasville Pa., Webster Stone Co. Irvington Ky., Federal Lead Co. Flat River Mo., and a host of other plants.

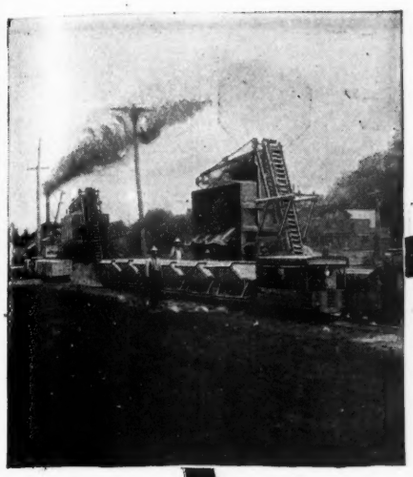
Glad to send you our breaker Catalogue No. 166 and our Bulletin No. 2F11 describing the Telsmith Reduction Crusher

SMITH ENGINEERING WORKS

3188 Locust St., Milwaukee, Wis.



545 Old Colony Bldg., Chicago, Ill. 30 Church St., New York City. 930 Oliver Bldg., Boston, Mass. 325 W. Main St., Louisville, Ky. Garfield Bldg., Cleveland, Ohio. Franklin and Channing Aves., St. Louis, Mo. Salt Lake Hardware Co., Salt Lake City, Utah. 625 Market St., San Francisco, Calif. Road Builders' Eq. Co., Portland, Ore. Watson, Jack & Co., Montreal, P. Q. Kelly-Powell, Ltd., Winnipeg, Man.



Increased Tonnage at Half the Cost.

One Mile of Road in 8 Days

A record for speedy road building in which five Plymouth Gasoline Locomotives played an important part.

Eight miles of concrete road, 24 feet wide and 10 inches deep, from Mt. Clemens, Michigan, to city limits of Detroit, must be finished this year. The Plymouth Gasoline Locomotives are used to haul the material to the workmen. Tons and tons of it must be hauled in uninterrupted frequency, and the contractor says the "Plymouths" are doing their part quite satisfactorily—More tons hauled at half the cost.

What is Your Haulage Problem?

Are you interested in saving time and money in accomplishing your haulage?

Underground—Surface—Inter-Haulage

From One Department to Another

The "Plymouth" makes good on any haul where tracks can be laid.

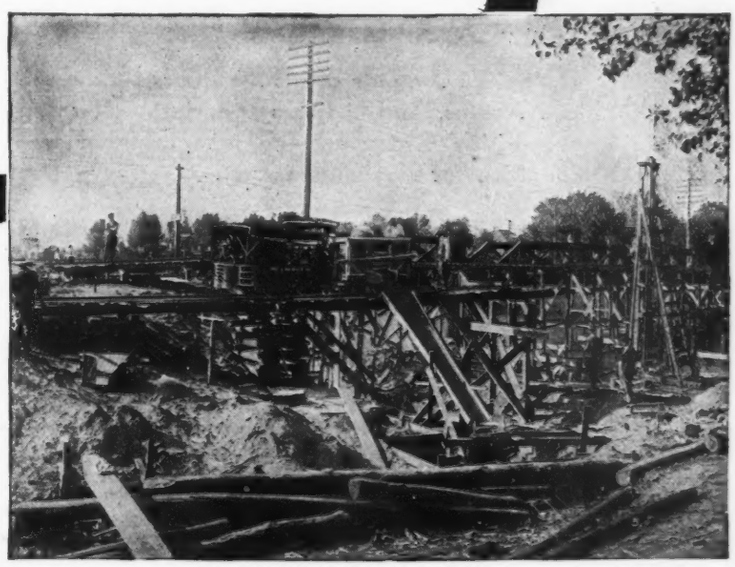
Letters on file from users say that it results in more tons hauled at less than half the cost of horse drawn vehicles.

Lowest cost for upkeep—and repairs seldom necessary. Write for our illustrated catalog, showing how the locomotive takes grades and curves with full load, etc.

Let our engineers consult with you. They will tell you whether or not your haulage problem can be aided by Plymouth Gasoline Locomotives.

THE FATE-ROOT-HEATH COMPANY
(Successors to The J. D. Fate Co.)
210 Riggs Avenue **Plymouth, Ohio**

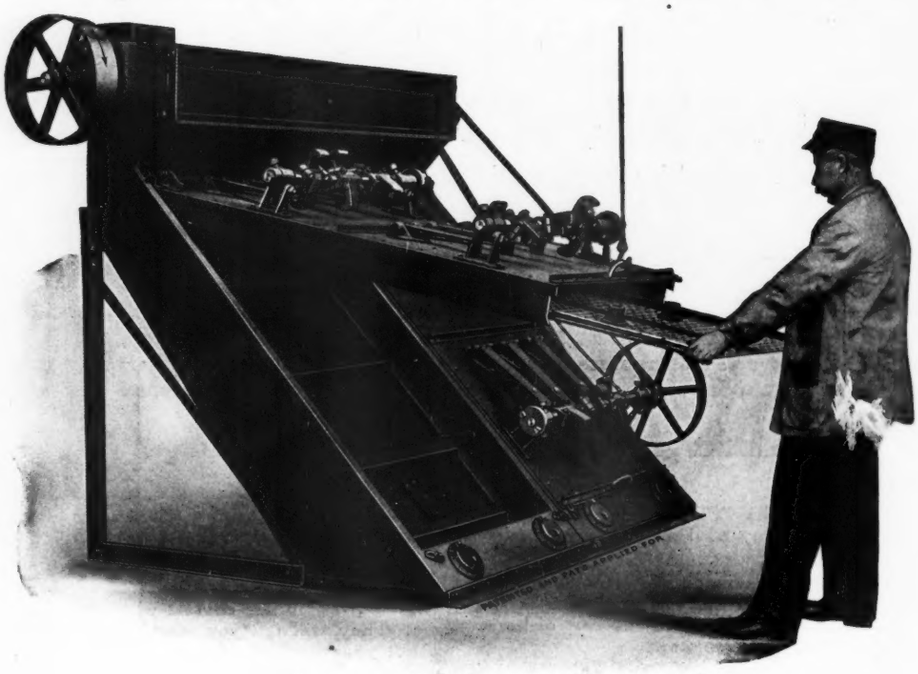
Representatives in All Principal Cities



"ONE MAN – ONE MINUTE"

STURTEVANT "OPEN-DOOR" MACHINERY

"Open Door" Sturtevant Super-Screen



The Super-Screen not only screens everything screenable with a range of 4 to 160 mesh, giving from one to four products from one machine, but is of Sectional, or Unit, "Open Door" construction with all parts interchangeable and of such small size that one man can handle them easily and quickly. Add sufficient number of Units to secure output wanted.

You see one man opens the door, removes the screen frames, both scalper and fine screens, and tightens the cloth—all through the open door. A one man proposition throughout—no time or labor wasted. Keep the screen in perfect condition for maximum output.

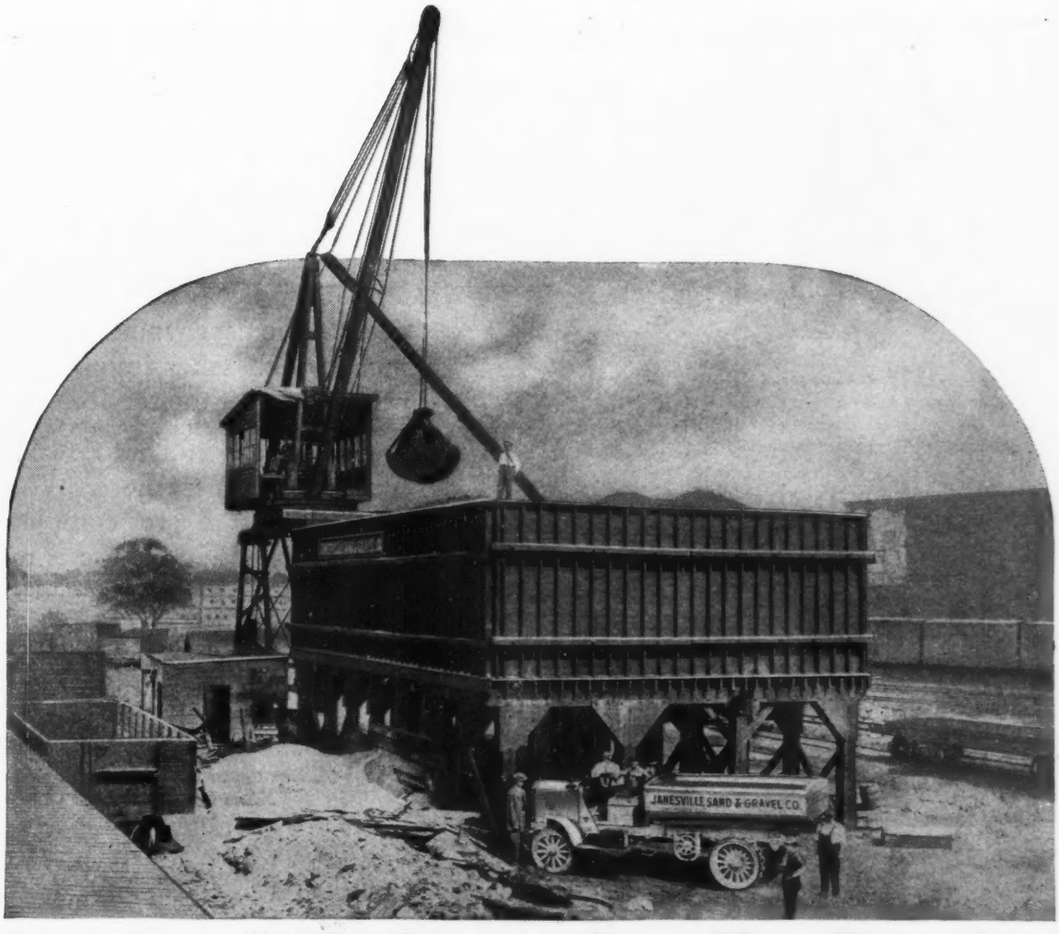
Open Door Super-Screens, like all other Sturtevant "Open Door" Machines, are built for service, to give maximum profit, to do your work cheaper than any other Screen, and they last.

Send for Catalog of Open Door Designs of Crushing, Grinding, Screening, Elevating, Conveying, Weighing and Mixing Machinery.

STURTEVANT MILL CO., BOSTON MASS.

HARRISON SQUARE

To say you saw the ad in ROCK PRODUCTS gives tone to your inquiry



"American" Machinery Cuts Handling Costs

"AMERICAN" Machinery handles sand, gravel, crushed rock, etc., economically and speedily from barge or car to storage bins or hoppers.

The great number of successful sand and gravel companies using "AMERICAN" Machinery exclusively is proof of its value for this service.

The illustration above shows the plant of the Janesville Sand and Gravel Co., Janesville, Wis., with an "AMERICAN" derrick on top of the bins. This derrick, which is operated by an "AMERICAN" Steam Hoisting Engine, transfers the sand and gravel from cars to the hoppers. Its long boom covers every part of the hoppers.

A letter to us outlining your handling problem will not place you under any obligation—and may help you to effect worth-while savings on your handling costs.

No matter where you are, an "AMERICAN" representative can reach you in twenty-four hours.

"Give me where I may stand and I will move the world"

American Hoist & Derrick Co.
55 South Robert Street
Saint Paul Minnesota

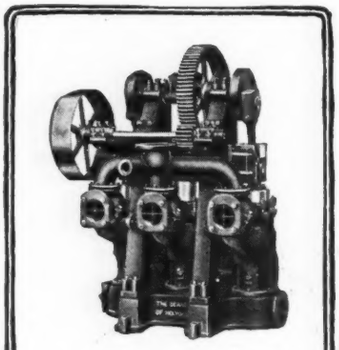
New York Chicago Seattle Pittsburgh New Orleans Detroit

Builders of "AMERICAN"

Hoisting Engines
Electric Hoists
Derricks
Locomotive Cranes
Railroad Ditchers
Logging Equipment
Sugar Cane Machinery
Marine Deck Machinery and Tackle
The Genuine "CROSBY" Wire Rope Clip

AMERICAN
HOIST & DERRICK CO.

It gets immediate attention if you mention ROCK PRODUCTS



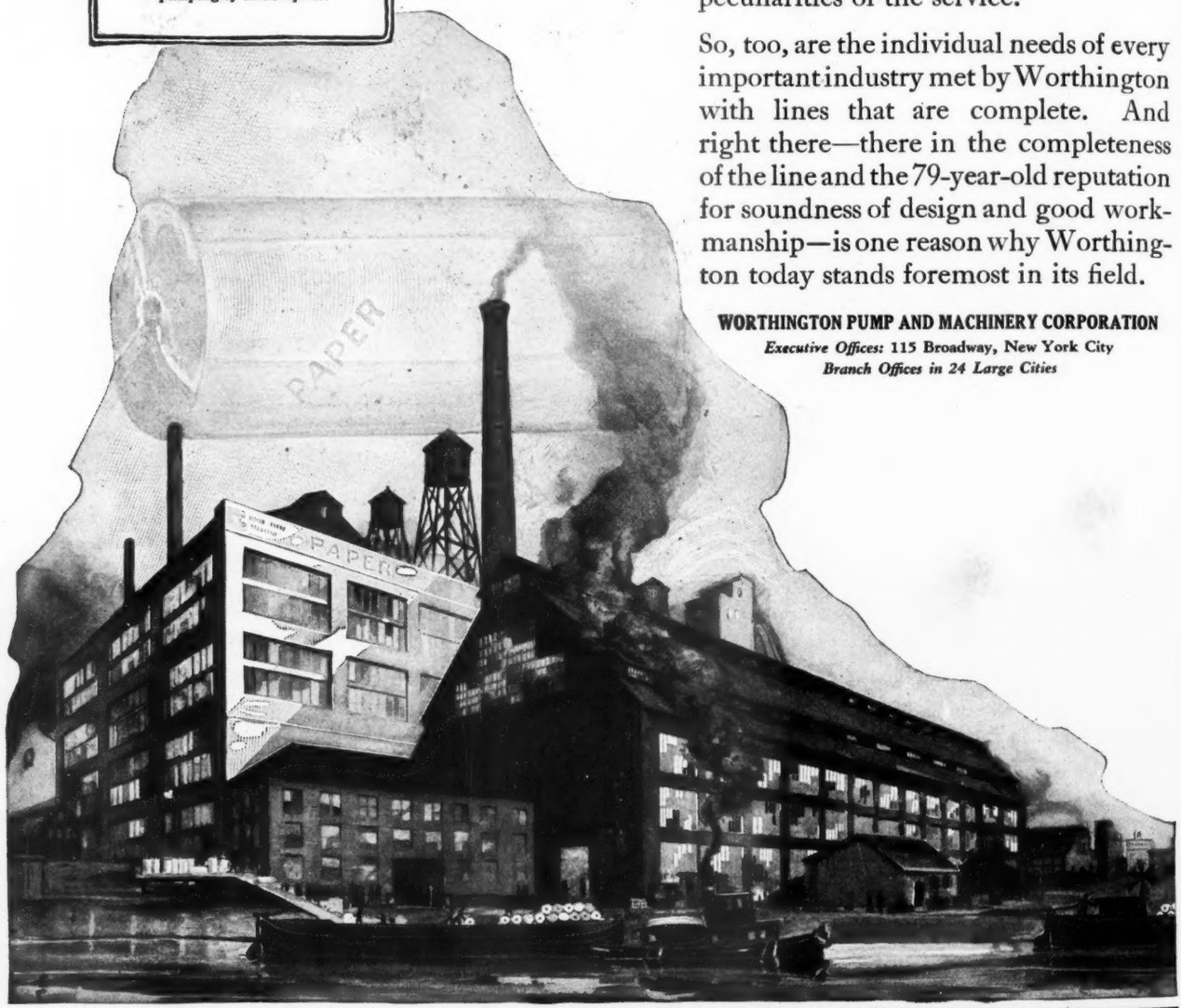
Pump designed particularly for pumping of thick liquids.

The peculiar pump for paper pulp— an example of Worthington thoroughness

PUMPING thick pulp—a task for an unusual pump. Yet it is characteristic of the thoroughness of Worthington that this company meets not only this, but every other hydraulic need of the paper industry, with equipment which takes into account all the peculiarities of the service.

So, too, are the individual needs of every important industry met by Worthington with lines that are complete. And right there—there in the completeness of the line and the 79-year-old reputation for soundness of design and good workmanship—is one reason why Worthington today stands foremost in its field.

WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
Branch Offices in 24 Large Cities

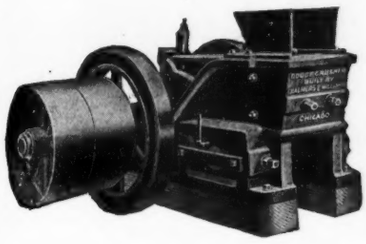


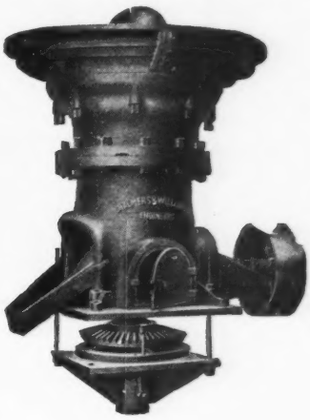
PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Deane Works, *Holyoke, Mass.* Hazleton Works, *Hazleton, Pa.* Laidlaw Works, *Cincinnati, Ohio* Gas Engine Works, *Cudahy, Wis.*
Blake & Knowles Works *East Cambridge, Mass.* Worthington Works *Harrison, N. J.* Power & Mining Works *Cudahy, Wis.* Snow-Holly Works *Buffalo N. Y.*

Saying, "I saw it in ROCK PRODUCTS," will bring quick action





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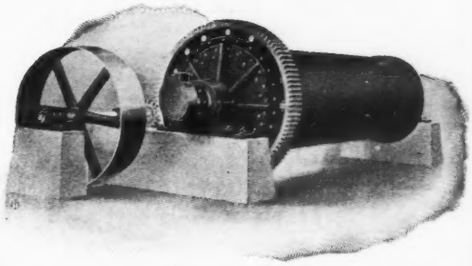

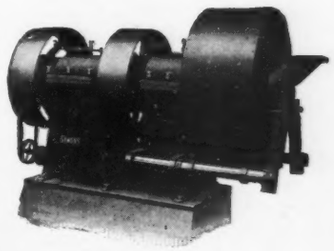

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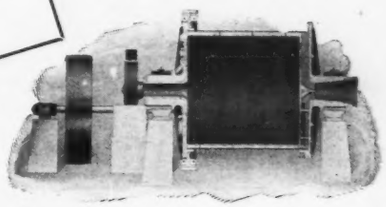

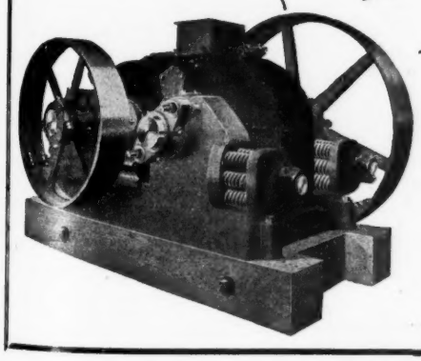

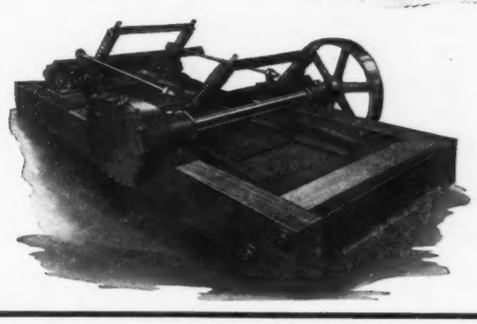

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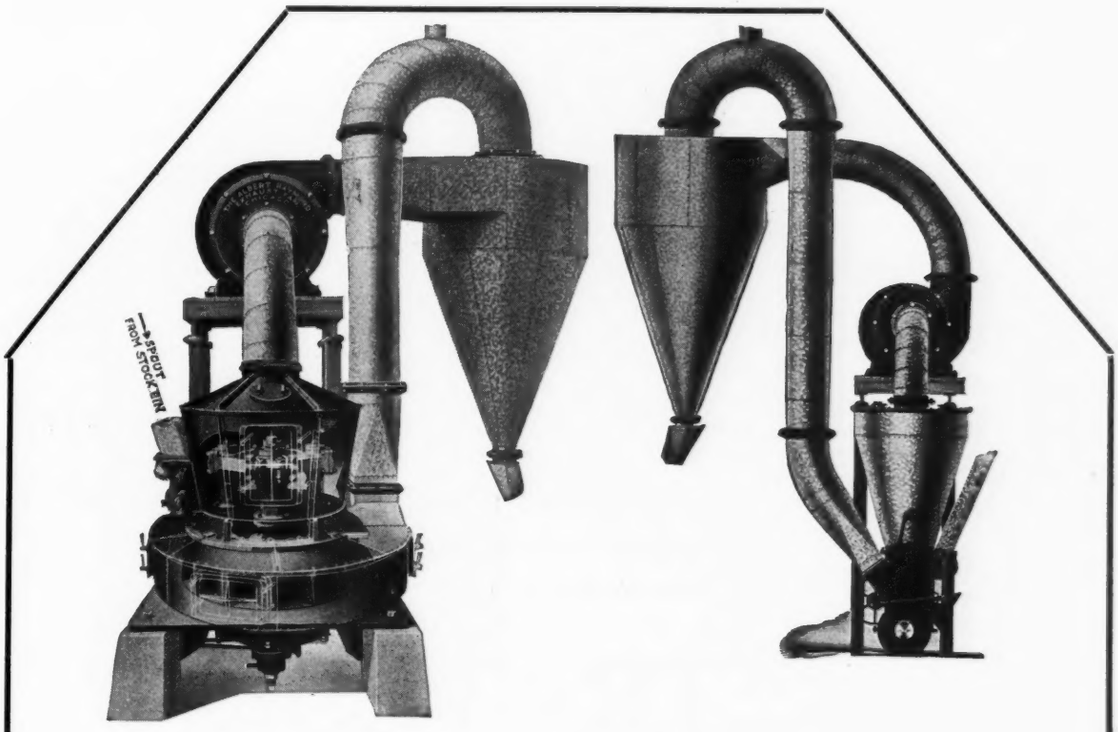

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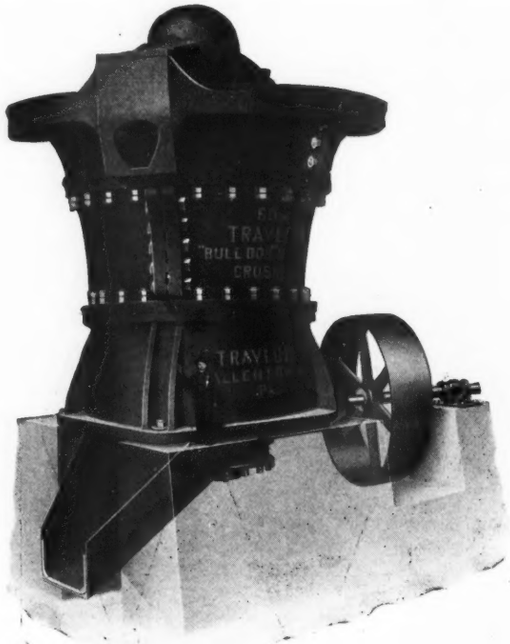

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Vol. XXII Chicago, November 22, 1919 No. 24

Most 1920 Problems Hinge on Railways

Complex Problem Facing Producers of Mineral Aggregates Who Ask for More Railway Equipment, Better Service and No Further Increase in Freight Rates

FACING A SEASON which promises to develop a greater demand than any previous season by at least 100 per cent, the producers of mineral aggregates find themselves confronted with the most complex problems the industry has ever encountered.

All others are minor issues as compared with the big issue of TRANSPORTATION. This is made clear in the very excellent summary of the mineral aggregate industry by E. Guy Sutton, secretary of the National Association of Sand and Gravel Producers, printed elsewhere in this issue. While this has already received wide circulation as Bulletin 4 of the Association, it is worthy of a most careful re-reading by those who have already seen it. The same holds true regarding the statement of issues before the crushed-stone men by A. P. Sandles, secretary of the National Crushed Stone Association, also printed in this issue.

The mineral aggregates fraternity is in the very disadvantageous position, or soon will be, of asking or demanding of the railways more cars and better service, and in the same breath asking to be exempted from freight rate increases, which undoubtedly must be heaped on most other commodities. Obviously, the situation calls for the utmost skill and diplomacy, and these can not be had except by the most active and disinterested co-operation and harmony.

A very fair statement of the railway attitude was given by Director-General Hines at a meeting of the railway executives in Chicago on November 18. Mr. Hines said that it was improbable that Congress would enact permanent railroad legislation before January 1. The result, he declared, would be the restoration of the lines to their private ownership under a temporary act, which would necessitate an application for increased rates before the Interstate Commerce Commission.

In that manner, Mr. Hines implied that increased rates were to be expected, though he did not touch directly upon the government's deficit. He further said that the public might be expected to resist the application vigorously, since the general impression prevailed that the return of the rail lines to their original owners would prove the touchstone to cure all their existing ills.

The lack of facilities, which has hampered the Railroad Administration, will be present after the lines are returned. In addition, there may be expected a general increase in traffic, which should continue for some time. Labor conditions, which had presented many problems in the past, are still far from composed.

In that connection let me call attention to the popular misconception that prevails concerning wage increases granted by the government. It is a general assumption that the administration dealt with the railroad brotherhoods with a lavish hand. As a matter of fact, however, the increases in pay granted since 1917 total 57 per cent, whereas a certain large industry, with which you all are familiar, has swelled its pay roll 115 per cent in the same period.

It is to be expected that keen competition will result when government operation ends. Some of the lines feel that they have been discriminated against during federal control and will make strenuous efforts to regain ground. I wish to urge upon all officials the necessity for cautiousness.

The contracts between the government and the railroads relating to the return of the properties will be strictly carried out. The lines will be returned in as good condition as they were when the government took them.

It has been difficult in the last two years to get cars and materials, and it has been necessary to turn whatever equipment became necessary to our military needs. No doubt the public has been inconvenienced, and now that the emergency has passed, the administration has been criticised for errors, both fancied and real, and with only partial consideration of the stress under which it was obliged to act.

As reflection of that criticism will be seen when the lines have been surrendered, the public will expect a great deal from the owners, and the latter will find conditions not materially different from those the government has been obliged to combat.

For example, the public will look to the roads to effect economies of operation and to thus meet additional operating expense rather than through an increase in rates. And like in the old days—unless Congress enacts permanent legislation before the first of the year, which does not now appear likely—the rate controversies will have to be carried before the Interstate Commerce Commission.

The demand of mineral aggregate producers for better service at the same price in the face of the present railway situation appears on the face of it both inconsistent and futile. But it is not. It is based on sound principles, and if properly presented with an adequate array of facts and statistics, with the backing of interested public authorities, should certainly stand a very fair chance of being listened to. But the voice which makes the demand must be loud and powerful, i. e., it must come from *whole organized industry*.

National "Agstone" Association Expands

Year of Sandles' Pulmotor Treatment Makes Association National Influence

ABOUT A YEAR AGO the National Agricultural Limestone Association was reorganized with A. P. Sandles as executive secretary and C. R. Wagner as field representative. Previous to that time the Association had had a precarious existence, and to say the least, fell far short of fulfilling the specification of its title. Nevertheless a few far-seeing, broadminded producers (six, to be exact) would not abandon a project of so great promise, and they have continued to support the Association through all its vicissitudes.

On November 18 at Columbus, Ohio, was held the first annual meeting of the re-organized Association. It has cleared itself of debt, has been active in field work in Ohio and in the bordering states of Indiana and Pennsylvania, has published a bulletin, "Dollars and Sense," which has been distributed on request in practically every state in the Union, and through ROCK PRODUCTS, Mr. Sandles says, several requests have come from interested parties in Europe. The Association has engaged in special advertising and through co-operation with the Ohio Macadam Association has developed a splendid advertising medium of its own in "Macadam Service," which now has a circulation in rural Ohio, Indiana, Pennsylvania and New York of 7,000 monthly.

Build on the Future

C. R. Wagner, field representative, who is a genuine farmer by training, experience and habit of thought, made a masterly report of his season's activity, which could hardly have left a doubt in the mind of any producer of the feasibility of continuing the work. Was there any such doubt it was speedily removed by Prof. Firman E. Bear, chief of the soils department, Ohio State University, who earnestly urged the continuance of the Association as a public benefit, and as a great aid in the agricultural development of the State.

Professor Bear said that knowledge of the helpfulness of ground limestone in agriculture was constantly expanding; and he went so far as to say that there probably was no soil in the State of Ohio which would not be benefited by the use of limestone. He said the problem of promotion must be the perpetual hammering away on the subject of using limestone as part of the regular crop rotation program until the use of limestone became a tradition like that associated with clover crops. He said it did not matter what time of year or in what stage of the crop rotation the limestone was applied—the main thing was to get in permanently in the crop rotation program. The farmers, he said, must be educated away from the habit of looking for immediate results from the use of

FIRST ROW, left to right—A. P. Sandles, Claude L. Clark, C. R. Wagner, Mrs. Edward Silver, W. H. Hoagland, F. R. Kanengeiser, Miss M. B. Miller, Prof. Firman E. Bear. SECOND ROW, right to left—W. H. Margraf, Nathan C. Rockwood, Clyde Calvin, John Laughlin, E. A. Barr, A. N. Spencer, E. S. Hanson, H. E. Bair. TOP ROW, left to right—W. M. Brown, C. J. Carew, Morton R. Grinnell, G. E. Bear, C. Brown, A. Acton Hall, G. W. Winwood

limestone, and must consider only its necessity in the crop rotation program.

Professor Bear said further that he believed the farmers of Ohio were "sold" on agricultural limestone, and it was not so much now a promotion problem as a problem of distribution, and in the solution of this problem he believed the Association could be of very great usefulness. He gave as a conservative estimate an annual consumption of 2,500,000 tons of agricultural limestone in the State of Ohio alone, as soon as this problem of distribution is satisfactorily solved.

Activities in 1920

For the coming year a budget of between $7,000 and $8,000 has been prepared. Besides maintaining and expanding the promotional work already under way, the president-elect, F. R. Kanengeiser, announced the following program: (1) Investigation and action looking toward the adoption of a uniform cost-accounting system and the exchange of cost data; (2) establishment of a traffic committee to see what can be done to hold down the freight rates on agricultural limestone in case of any attempt on the part of the railways to obtain a general advance in rates; (3) establishment of a committee to study and investigate the problem of storage and distribution of agricultural limestone on the farms.

Eight new members were elected, including producers in Pennsylvania, Indiana and Missouri. The constitution and by-laws were amended to admit machinery men as associate members.

The following officers were elected for the ensuing year: President, F. R. Kanengeiser, vice-president and general manager of the Bessemer Limestone and Cement Co., Youngstown, Ohio; vice-president, John Laughlin, general manager of the Stone Products Co., Bedford, Ind.; treasurer, W. H. Hoagland, vice-president and general manager of the Marble Cliff Quarries Co., Columbus, Ohio; secretary, A. P. Sandles; national field lecturer, C. R. Wagner. The following directors were elected: Chairman, H. E. Bair, general manager of the France Stone Co., Toledo, Ohio; A. Acton Hall, Ohio Marble Co., Piqua, Ohio; Henry Angel, Kelley Island Lime & Transport Co., Cleveland, Ohio; W. N. Spencer, Columbia, Mo.; W. H. Hoagland, Columbus, Ohio; Morton R. Grinnell, Yellow Springs, Ohio; J. C. King, Carbon Limestone Co., Youngstown, Ohio; E. A. Barr, Newcastle Lime & Stone Co., Newcastle, Pa.

Make Reservations for Crushed Stone Convention

Many Serious Problems Confronting the Quarry Industry Must Be Acted Upon Next February in the City of Convivial Spirits

THE NATIONAL CRUSHED STONE ASSOCIATION'S annual meeting will be held February 10-11-12, 1920, Louisville, Kentucky. There are many reasons why the *entire* crushed stone industry should be present:

First: Enough capital is invested and enough men interested and wage earners toiling to make this industry recognized as one of the big factors in the nation's welfare. The industry is on the way toward a strong and substantial organization.

Second: The standardization of crushed-stone sizes is coming. Engineers, federal, state and county officials are agreeable to inviting such a policy. Crushed-stone operators have a chance to have a voice in these standards if they will speak through and as an Association.

Third: The United States Railroad Administration has a big deficit. Daily this deficit grows larger. This fact insures a big increase in freight rates. Other industries are getting ready to protect themselves in this matter. In proportion to market prices, the stone industry is already overloaded with freight rates. Every stone operator in every line of the crushed-stone game should be at Louisville and assist in making the National Crushed Stone Association the national spokesman at Washington in this matter.

Fourth: It seems almost sure that radical changes in rail rate policies are just ahead. Indications are that the Interstate Commerce Commission will be given greatly increased powers. The mileage basis looms a big possibility. Minimum and maximum rates are likely to be established. Stone men must get together if they expect their voice to be heard.

Fifth: Legislation is pending in the matter of distributing thousands of war motor trucks and other machinery for road repair and construction to State Highway Departments, county and township highway officials. Public sentiment should be molded so as to support and insure favorable legislation on this question. If this material and machinery can be utilized instead of idly rusting and rotting, a great impetus will be given to highway improvement.

Sixth: The increasing cost of labor and material is gradually forcing stone prices to higher levels. How can public sentiment best be educated along this line?

Seventh: The agricultural limestone industry is sure to be one of the most important phases of the crushed stone game. Agricultural colleges, experiment stations, county farm bureaus, state and federal organized agricultural forces are ready to join agricultural limestone producers in a vigorous campaign for a greater production and use of "Agstone." How can the crushed stone industry best play its part in this matter?

Eighth: The matter of continuing federal aid for highway improvement is a matter that should not be overlooked. Congress and the Government face a big deficit. The absolute need of good roads in this nation must be forcibly presented and established.

Ninth: Shall the right of states to fix rail rates within the States be restored or shall we approve a policy of official Washington continuing full control in the matter of making all freight rates?

Tenth: How shall we solve the quarry labor problem in the United States and Canada with restricted immigration? One large Canadian producer has had much success with a bonus system. Others are establishing profit-sharing. There is much to be said on these subjects.—A. P. SANDLES, Secretary.

Future of the Agricultural Lime Industry

Lime—A Natural Fertilizer for Ages and for Nearly All Soils

By James L. Burgess
North Carolina Department of Agriculture

WE ARE JUST NOW BEGINNING to re-discover one of the most important elements in the control of successful agricultural practice. For ages; yes, as far back as the dawn of history, some form of lime has been valued among the tillers of the soil as an aid, in some way, to plant growth.

The richest lands known in all countries were either flood plains or limestone or chalk lands, or lands derived from underlying rocks that contained lime as an important constituent. The richest soils in our own country are the flood plains (bottom lands) along the main water courses or the calcarious soils derived from the vast loess formations in the middle west.

The soils of our western prairies are all highly calcarious and here it is that we find our unrivalled conditions for grass growing and live stock production. The Kentucky blue grass region is famous the world over as a grass-producing and live-stock region; and this region owes its prime productiveness almost entirely to the presence of large amounts of lime carbonate in its soils. Even the rich flood plains would not grow their bumper crops were it not for the presence of the lime leached out of the upland soils and deposited as calcarious clays and silts during seasons of overflow. But while all rich lands everywhere show a good supply of lime in the surface soil, all arable lands are by no means rich, for they do not contain a sufficient amount of lime as a basis on which to build fertility.

Supply of Raw Lime

Is there a sufficiently large supply of raw lime to justify the laying of plans for the development of a large business in the agricultural lime industry? It may be thought strange, but it is true that nearly every state in the Union, if not every one, contains more or less important natural lime deposits either in the form of limestone or shell marl. Practically all the seacoast states have various grades of marls and many of them, like North Carolina and Virginia, contain hard limestone deposits as well. The supply of raw lime is, therefore, not only well distributed over the United States, but a glance at a geological map will show the amount well-nigh unlimited.

The main difficulty with this vast supply of raw material lies in its location with reference to lines of transportation. Many of the best deposits lie so far from the main lines of railroad that the present prices for agricultural lime hardly justify the expenditure of sufficient capital to develop them. But as the demand increases (as it surely will) these outlying deposits will be gradually brought under development.

Most Soils Need Lime

Does the agricultural demand for lime justify the hope of a large development in this field of endeavor? While the total supply of raw lime in the United States is practically unlimited, and while most soils have been derived from rocks that originally contained lime as a leading constituent, still most of the soils in the more humid sections that have been under cultivation for a number of years are now found to lack a sufficient supply of lime for the most economic production of crops.

Lime is the most soluble mineral constituent of soils and, therefore, the one most easily depleted from the cultural zone. Many strictly limestone soils lack a sufficient supply of lime in the first 6 in. of the surface, and wide awake farmers in the limestone sections who recognize this fact are now beginning to use agricultural lime for soil improvement purposes. While traveling through the Shenandoah valley some time ago I found many of the farmers on those once-calcarious clays using agricultural lime as successfully as it is used on the sandy loams and non-calcarious clays on the Atlantic seaboard.

We may now be said to be entering upon the renaissance of the art of soil improvement by safe and permanent methods. For years farmers have had it dinned into their ears that the use of the three elements of plant food, namely, phosphate, potash, and nitrogen, was the only way out of our dilemma of greater production or starvation. To use more fertilizer every year is the present practice among, perhaps, two-thirds of the farmers in the older districts of the United States. The idea of permanent soil building on a foundation of agricultural lime and soil humus derived from stable, stall and green manures has been woefully neglected by the vast majority of our land owners; and has only recently been forcing itself to the front among the more intelligent of our rural population.

I am not going to state that the fertilizer companies feel it to be to the advantage of their business to keep the soils of the country in a permanently low state of cultivation, but I have felt that some of the more short-sighted of their representatives have not used their influence in a way to encourage the use of lime in agriculture. At present, however, some of the leading fertilizer companies, while vigorously maintaining that "Lime is not a fertilizer," still use pulverized limestone as a filler in some of their mixed goods; and, in some cases, are actually in the field selling pulverized limestone to the farmers to be used on the land ahead of the fertilizer application.

Proper Amount To Use

The average acre application of lime is so much more than that of any other fertilizer element that the total demand is likely to be very large as soon as the farmers become aware of its intrinsic value.

Hardly less than one-half the soils of the United States would be greatly benefited by the use of agricultural lime, and much, if not all, the newer areas now being reclaimed along the coasts, where drainage is poor and the organic matter content of the soils is high, will respond freely to applications of either burned or unburned agricultural lime.

How much should be used to the acre? The amount to be used depends on a number of factors, chief among which are the condition of the soil and the farmer's financial condition. In the future development of the agricultural lime business the education of the farmer must be born constantly in mind. He must appreciate the value of your goods before he will invest his money. The commercial fertilizer people do not stop at small expenditures to get the farmer to understand the merits of their products and the agricultural lime people must take a lesson from their experiences.

The state of North Carolina, recognizing this fact, got behind the movement to use agricultural lime on the farms and the effect has been magical—the lime grinders having received more business through the advertising given by the state than they ever hoped to get through individual advertising in three times as long a period. Our farmers now have confidence in agricultural lime and are getting wonderful results. Of course the prestige of the state behind the movement gave us an advantage that

cannot be had in states where the state officials are not interested in the matter of basic soil improvement. But can the different state officials not be interested in such matters? The state officials of Virginia and North Carolina are behind this agricultural lime movement, why should not others take a hand? I think they will if the proper facts are brought before them.

We encouraged our farmers to use a small amount at first as an experiment to see what lime rock dust would do on a clover crop. From the use of a small amount at first they now use from one to two tons to the acre, depending on the supposed acidity of the soil and the known needs of the crop. We are now reaching the point where we can advise them to use one or two tons to the acre with some assurance of having our advice respected. Two tons to the acre every three or four years will, on the average, keep the upland soils of this country in about the right condition to render the commercial fertilizers most responsive to crop growth.

Lime Re-Acts On Soil Minerals

It is a common experience along the Atlantic seaboard that an application of agricultural lime more than doubles the yields. I have known a number of cases in North Carolina where an application of a ton of lime alone doubled the acre yield of corn and hay. No other fertilizer elements were used and the crop received the same cultural treatment as in previous years when no lime was used.

Now let us calculate a little and see just what this lime actually did for the crops. The crop without lime was 15 bushels to the acre, the crop with lime was 30 bushels to the acre. Of course every one knows that 30 bushels of corn contain twice as much potash, phosphate, and nitrogen as 15 bushels contain; and where did these additional amounts of plant food come from? They were certainly not placed in the soil along with the agricultural lime and still they are found in the crop. No other factor of crop production was changed or interfered with—only the ton of lime was added. It is irrefutable, therefore, that, in some way or other, the lime rendered these additional amounts of plant food available from the native supply in the soil—the agricultural lime liberated the otherwise inert and unavailable plant foods and placed them where the plants could get them.

Lime As a Fertilizer

We must, once for all, if we expect agricultural lime to take its rightful stand before the people, get rid of the old idea that agricultural lime has value only as a corrector of soil acid. Agricultural lime has, perhaps, a half dozen other values, any one of which is of more importance than its acid correcting value. Lime is **just as much a fertilizer** as phosphate, potash, or nitrogen.

Try to grow a crop without lime in your soil and you make a most miserable failure. No plant can be matured without lime in the soil. It is entirely essential to plant growth. Then why not look upon it as a fertilizer? But some insist that our soils have sufficient for all crop uses. This is a most serious mistake and is always made by men who are not familiar with the facts. Lime is a fertilizer in the truest sense of the word and must be so considered before it can secure its rightful position in the minds of the farmers and on the markets of the world.

For most soils of this country the plant food requirements should range about as follows, putting the most important first and the least important last: Phosphate, nitrogen, lime, potash. And I have stated above that much of the needed phosphate and potash can be more easily and cheaply secured through the use of lime than by any other means.

An average upland soil of the United States contains enough native potash in the first 6 in. for 1,236 fifty-bushel crops of corn, and enough native phosphate for 248 fifty-bushel crops of corn; enough native potash for 1,118 twenty-five-bushel crops of wheat, and enough native phosphate for 356 twenty-five-bushel crops of wheat; enough native potash for 3,602 five hundred pound bales of cotton, and enough native phosphate for 194 five hundred pound bales of cotton; enough native potash for 500 three hundred-bushel crops of potatoes, and enough native phosphate for 219 three hundred-bushel crops of potatoes. Extend this depth to 18 in., the average depth of the feeding zone of plants, and you can multiply these figures by three.

But how shall we utilize this abundant supply of plant food in our possession? This question has long puzzled the agriculturalists of this country, but at last the answer seems to be in sight from the observations on the effects of the use of agricultural lime. Practical demonstrations, as well as all theoretical considerations, point to the liberal use of lime and organic matter as the key to unlock this vast store of mineral fertilizer elements.

Lime and Humus Make Lime Nitrate

Again, the use of lime on lands well supplied with humus secures for the farmer, without additional cost, all the otherwise expensive nitrogen his crop needs. Indeed, this is coming to be looked upon as the most important reason, aside from furnishing the element calcium to the plant, for the use of lime in soils—to secure nitrogen from the air.

How? As follows: In the decomposition of humus by bacteria in the soil, nitric acid is formed. The presence of any considerable amount of free nitric acid in the soil moisture checks, and finally completely arrests, further formation of nitric acid, or other acid from the soil humus. But when there is present an abundance of lime carbonate, associated, at the same time with other conditions favorable to nitrification, the lime of the lime carbonate is appropriated by the nitric acid formed, setting free the carbonic acid and leaving, in place of the lime carbonate, LIME NITRATE, which is the **chief compound** from which agricultural crops derive their supply of nitrogen.

In this neutralization of the nitric acid by the lime the soil is prevented from becoming sour, and nitrification goes forward continuously at a rapid rate. At the same time that the nitric acid is passing from the organism, which excretes it as a waste product, to the lime of the lime carbonate to become neutralized, this free nitric acid and the carbonic acid, too, in its turn, when it is set free from the lime by the nitric acid, act together in increasing the dissolving power of the soil moisture for the other essential plant food elements in the soil. Thus it is seen that carbonate of lime not only takes a necessary part in putting the nitrogen of humus in food form to supply crops, but it also aids in bringing other plant food elements into available form as well; and it is a common experience that soils comparatively poor in potash and phosphoric acid, if only the **humus** and **lime content** are kept high, may yet produce large yields, because the same action which develops from the humus the lime nitrate sets free in the soil moisture more potash and more phosphoric acid. This is why an abundance of lime carbonate in the soil is associated with high productiveness.

Forms of Agricultural Lime

Of course the equipment for the production of agricultural lime will depend on the form of lime the farmers will demand in the future. "In what direction is the tendency at present?" is the vital question today. The form as well as the amount of lime to be used will depend on soil conditions. There are some sections of the country, the newer sections in particular, where the organic matter content of the soils is high, that will be more benefited, perhaps, from the use of burned than unburned lime. Such are the peaty lands around the sea coasts and the lake shores. But, as a general proposition, the soils of this country will be more permanently benefited by unburned than by burned lime—by lime carbonate than by caustic lime. There will usually be enough by-products from the commercial lime kilns to sup-

ply the demand in these restricted areas without going into the business of burning lime for agricultural purposes alone.

Since the most fundamentally important use of lime in agriculture, in addition to furnishing the element calcium to the plant, is for the liberation of the other, generally abundant, basic mineral elements of plant food; and for the accumulation of nitrogen it will be important to investigate the relative effects of these two forms of lime on the organic matter content of the soil.

Ground limestone neutralizes any excessive acidity and otherwise creates a favorable condition for the growth and multiplication of the nitrate-forming organisms in the soil. These organisms attack the soil humus and liberate its contained nitrogen and combine this nitrogen with lime to form lime nitrate; or with soda to form sodium nitrate; or with potash to form salt petre or potassium nitrate. All of these nitrogenous compounds are non-volatile solid bodies that are readily dissolved in the soil water and taken up by the crop. Little or none is lost by leaching under normal conditions as the crop takes it as fast as formed.

All the nitrogen thus developed from the soil humus is used to create more humus and, in this way, to increase the supply in the soil. The action is comparatively slow, and the soil organisms, collecting nitrogen from the air at the same time they are extracting it from the organic matter of the soil, greatly increase the total supply of nitrogen over and above the amount originally contained in the soil humus. The growing crop, thus enabled to use both the free nitrogen of the air and the combined nitrogen of the soil, will, under favorable conditions of agricultural practice, not only maintain but even increase the organic matter content of the soil while producing satisfactory yields for the farmer. But this is not generally so with burned lime.

Burned lime attacks the organic matter of the soil as it attacks one's flesh and destroys it by "eating away its substance through chemical action." During this process of chemical destruction of the organic matter, nitrogen is set free just as it is set free when one burns his corn or cotton stalks in the field. But when caustic lime acts on soil humus it first kills the nitrate forming organisms and liberates the nitrogen not in the form of a non-volatile nitrate, but in the form of ammonia gas that escapes from the soil into the air and is lost to the farmer and his land.

As this ammonia is escaping upward through a moist soil some is held in solution by the soil water and is finally oxidized to a nitrate and used by the plant; but all that fails to be caught in the meshes of the moist soil is, of course, lost and the soil relatively reduced in fertility. It is a common experience that caustic lime gives as good and, in some cases, better immediate results than ground limestone; but the experience is equally common that a large crop by the use of burned lime this year means a reduced potential fertility and a decreased crop yield the years following. Ground limestone does all the good things burned lime will do and none of the bad things.

But, as stated above, there are soil conditions that entirely justify the use of caustic lime in preference to carbonate of lime. It does, however, generally require a higher average intelligence to use burned lime than to use carbonate of lime without harm to the fertility of the land; and since lime carbonate is "fool-proof," we generally advise our farmers to use it rather than caustic lime for agricultural purposes. Moreover, unburned lime generally costs less and is much easier to handle. The present trend of things, therefore, seems to prognosticate the use of carbonate rather than caustic lime in the future.

Lime the Basis of Economic Fertilization

Agricultural lime is sure to become the basis of all economic fertilization in the future. Practical experience shows that an applictaion of agricultural lime is the best possible preparation for the following dressing of the more high-priced commercial fertilizer. Indeed, our leading authorities insist and practical experience shows that much less commercial fertilizer is required where liberal use of agricultural lime is made. In North Carolina we have constructed fertilizer formulas in which 1,000 lbs. of pulverized limestone or marl to the ton is substituted for potash; and these formulas have been tested with the very best results.

Just as the live stock business of the Kentucky blue grass region is based on a high lime content of the soils so the future development of this important industry along the Atlantic seaboard and in the other more humid regions of the country will depend, almost entirely, on the liberal use of some form of agricultural lime. Lime is absolutely essential to the successful growth of the clovers, alfalfa and most other legume crops; and these are the leading crops in the production of the best grades of live stock. "Lime and clover the Nation over" would be a good motto for the producers of agricultural lime; and the principle underlying this motto will certainly be the one moving force behind the permanent soil building of the future.

Agricultural Lime Must Stand Up for Its Rights

Until recently agricultural lime was looked upon as a material that might or might not be used just as the whim might strike the farmer. The antiquated advice to use it for soil acid only is like some other groundless theories, going the rounds of the agricultural press, that have cost this country untold millions of dollars. The correction of soil acid is, perhaps, in most cases the least important function of lime in agriculture. Limit its use in this way and half the arable lands of this country will go without lime, as not more than half our soils will show a pronounced acid reaction under test. Yes, lime is a fertilizer element and most soils are just as hungry for it as for nitrogen, potash and phosphate. We have just passed a law in North Carolina putting lime carbonate on the same footing as other fertilizers. This is the first time this product has had legal standing in this state and the lime companies are well pleased that their products are thought of sufficient importance to agriculture to require police control.

From this time forth let no man think that because agricultural lime is cheap it is of no particular value. Let the manufacturers insist that they are offering the farmers a real fertilizer and not a mere corrector of soil acid when, perhaps, the farmer has no acid to correct, and their goods will speedily impress itself on the agriculture of this country as no other single fertilizer element, except phosphate, ever has.

Household Use for Lime—Rat Preventive

J. H. D. writes: "Have enjoyed your articles very much, but your article on 'Rats the Pest Limit' was just a little disappointing as you said nothing about the use of unslaked lime. It has been such a help to me and is a real comfort to other housewives."

In the early fall fill anything that resembles a rat hole in the cellar with about a cupful of fresh lime. As a rule, rats will not come into the cellar at all, as they have to scratch away the lime to secure an entrance, and the lime gets into their eyes, making them sore. For domestic use this is much better than poison, and it sweetens the cellar also if it smells damp and close from damp weather.—Dr. Evans, in the Chicago "Tribune."

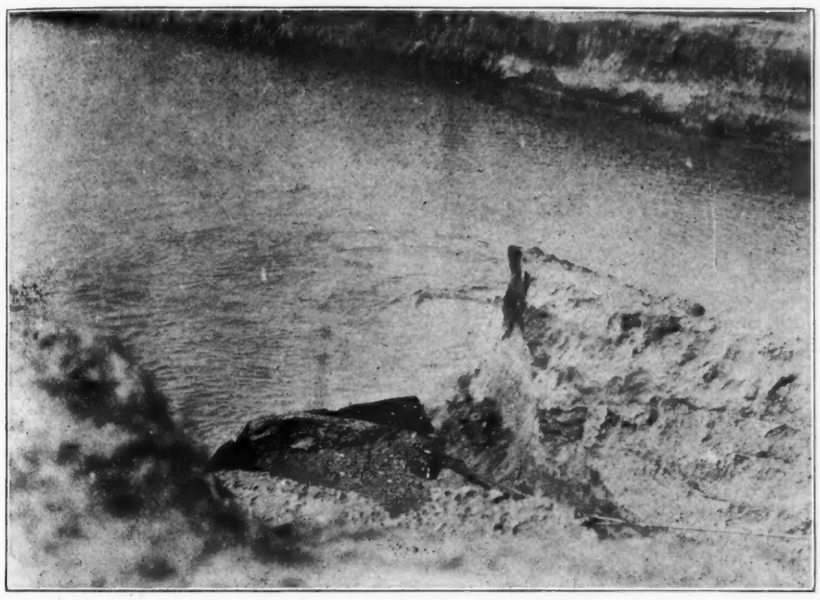
Lime for Fair Prizes

THE AMERICAN LIMESTONE CO., Knoxville, Tenn., Thos. McCroskey, general manager, has given away six tons of agricultural limestone as prizes at several community fairs in North Carolina. The first prize is three tons, the second, two tons and the third, one ton. There is reported to have been keen competition for the "agstone."

County Competition in Sand and Gravel Industry of Illinois

Kind of Operations Which Mislead Public Officials and Give Confusing Results in Both Costs and Quality

REPORTS OF LOW COST of production at four sand and gravel pits owned by Logan County, Illinois, three of which are operated by the county, are not borne out in investigations. The fourth plant is operated under contract. The claim of 19c per cu. yd. for production, widely circulated, it now develops, covers virtually only the labor pay roll. Other factors of cost are ignored, as investment in land and machinery, interest, depreciation, depletion, overhead, etc.



Drag-line bucket up-bound with load

The plant equipments are simple and portable; a scraper bucket of unusual character is used at three plants; at the fourth, however, a Sauerman slack line excavator outfit is installed.

A ROCK PRODUCTS representative visited one of the plants, a description of which will answer for two of the others.

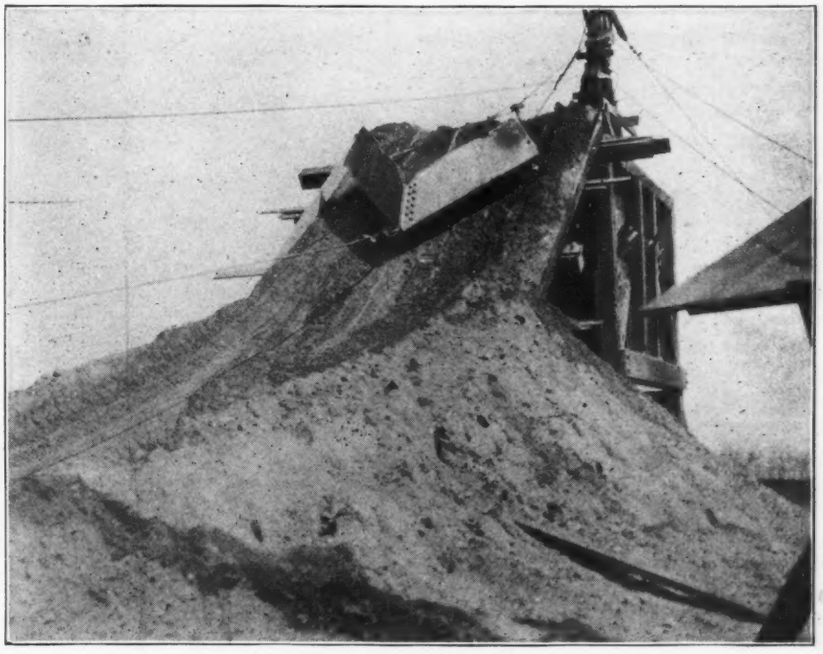
Four miles north of Lincoln, Ill., the county owns the tract which is operated under contract by L. P. Green of that city. At this place the overburden runs four feet deep and is stripped by the same scraper bucket used in excavating the road material. The stripping is simply scraped to one side.

The depth of the deposit of sand and gravel is not known, the contractor not having succeeded in touching its limits. In an area of 100 by 225 ft. Contractor Green removed 11,000 cu. yds. of material. According to County Superintendent of Highways L. H. Holland and Superintendent of County Gravel Plants, George E. Hoffman, the proportions of sand, gravel and clay are just right for making gravel roads.

The scraper bucket, the invention of S. D. LeClair of San Francisco, Calif., has two wide v-shaped sides, the angles of the v's opening inward. An end of one side is joined to an end of the other side, at an angle permitting a wide opening in front and giving it a capacity of 2 cu. yds. The pull cable is attached to each of the free ends of the sides. Mr. Green, who represents the inventor, asserts this bucket is one-third the weight of other scraper-buckets of same capacity. Owing to its construction, it reinforces itself, it is claimed, where other buckets need special reinforcement, because the load carried in the angle constitutes the reinforcing factor. It can be equipped with teeth and will then take the hardest kind of clay without "shooting."

The pull or load cable is 390 ft. long and the haulback cable 780 feet.

The receiving and loading hopper has a capacity of 20 cu. yds. The structure is 16 ft. high, 10 ft. wide and 14 ft. long. The lengths and a clearance of 7½ ft. allows a 4-horse team to drive under the hopper, which is 8½ ft. deep. A man



Rear view of bucket showing construction

operates the loading gate. All the teaming is done by contract. On short haul jobs, 8 4-horse teams have hauled 350 cu. yds. a day. On long hauls the haulage will drop to 150 cu. yds. a day.

A 9x10 2-drum hoisting engine and 60 h. p. boiler constitute the power plant. An engineer and fireman are used on short haul work because of steady arrival of trucks, but on long hauls the engineer does all the work. Less than two tons of coal is burned per day.

It is admitted by all authorities concerned in these county operations that the claim of 19 cents per cu. yd. for production cost is not inclusive of many important items, and the tendency is now to admit that probably the actual total costs are as great as at any similar operation.

National Sand and Gravel Bulletin Vol. 1, No. 1

THE FIRST ISSUE of the monthly magazine of the National Association of Sand and Gravel Producers has made its appearance and gives every promise of being an interesting and valuable adjunct of the Association. Eventually it should become a very useful medium for posting engineers and architects on the proper use of sand and gravel.

South American Magnesite Deposit Available for Water Shipment

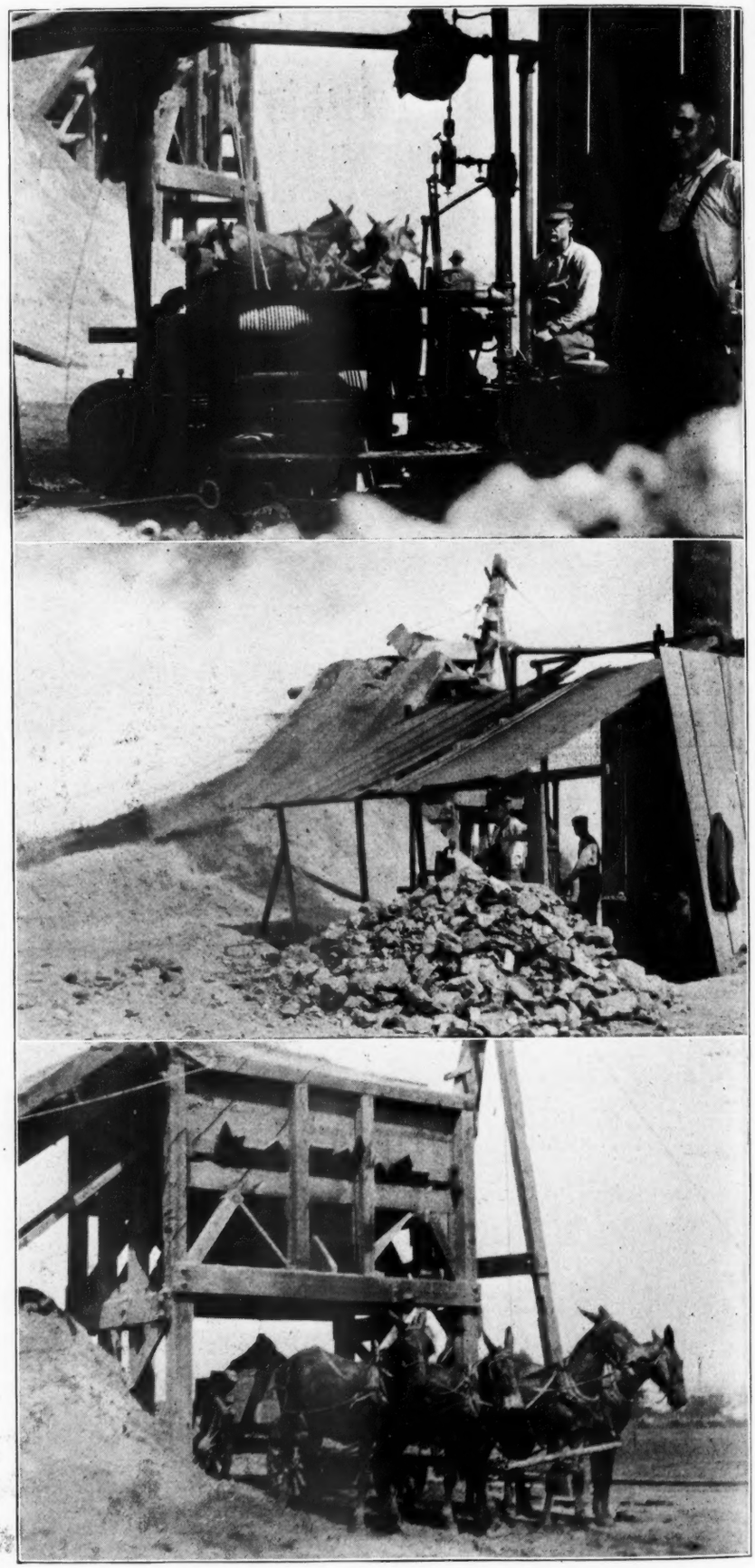
AMERICAN PRODUCTION of magnesite and artificial magnesite from dolomite faces further discouragement in the shape of a deposit of about 3,000,000 tons of native magnesite on the island of Margarita, 11 miles off the north coast of Venezuela. Property here has recently been acquired by the Magnesite Products Corporation of New York.

The magnesite occurs in the form of veins and seams in formations, similar to the California deposits, and in V-shaped troughs from 5 to 200 ft. deep. The widths of these trough deposits vary up to 284 ft. These can be quarried in the open with steam shovels at a cost, it is estimated, as low as $1 per metric ton.

An average analysis of these deposits is as follows:

	Per Cent.
Magnesia (MgO)	47.68
Carbon dioxide (CO_2)	50.98
Lime (CaO)	0.07
Ferric Oxide (Fe_2O_3)	0.19
Silica (SiO_2)	0.24
Alumina (Al_2O_3)	0.15
	99.31

It is said the development of these deposits on a large scale depends largely on the political complexion of the Venezuelan Government. The deposits are but a short distance from the sea coast and easy transportation to Atlantic coast points is assured.



Views of the Logan County, Illinois, sand and gravel plant

Comprehensive Presentation of Mineral Aggregate Production Problem

Forecast of 1920 Demand, Analysis of Conditions, Resume of Factors Involved in Increasing Production and Recommendations for Action

By E. Guy Sutton
Secretary, National Association of Sand and Gravel Producers

DURING THE YEAR 1916, according to the report of the Geological Survey, there were produced in the United States mineral aggregates approximately as follows:

Sand and gravel.....90 million tons
Crushed stone and chats 50 million tons

Total .....140 million tons

This was the largest production of these materials that has been reported, either previously or subsequently.

In the same year the sum of $136,000,000 was spent for surfacing roads, exclusive of municipal paving, for which work it is estimated that 40 million tons of aggregates were used, leaving 100 million tons for all other purposes.

Prospective Road Building for 1920

According to figures contained in a letter recently sent out by Mr. Thomas H. McDonald, Director of the Bureau of Public Roads, addressed to the State Highway Departments, there is actually available for expenditure on highway construction in 1920, $633,000,000, which, at an average cost of $20,000 a mile, will build 31,650 miles of roads, requiring 125 million tons of aggregates.

Other Construction Work

This road building program for 1920 does not take into consideration street paving nor the maintenance of existing highways; neither does it comprehend the aggregates that will be demanded for the erection of buildings, railroad improvements—including ballast—nor the many other purposes.

Because of the curtailment of general construction and maintenance work during the last three years, it can be estimated that there will be a demand for at least 50 per cent greater supply of aggregates for such purposes in 1920 than for 1916; or, say, 150 million tons.

Production Demand for 1920

On the basis of the foregoing figures, therefore, a total of 275 million tons of sand, gravel, crushed stone and slag must be produced in 1920 if the prospective construction program for that year is carried out, or an output of almost 100 per cent over that for any previous year.

Transportation the Controlling Factor

Mr. McDonald sets forth in his letter that the principal factors on which the accomplishment of the highway program for 1920 depends are as follows:

1. Supply of materials.
2. Shipping facilities.
3. Labor supply.
4. Contractors' organizations.

These four elements of uncertainty apply to other types of construction work as well as to highway building, while it is obvious that the controlling factor is TRANSPORTATION. It would be useless to increase the capacities of the plants producing mineral aggregates unless at the same time adequate transportation facilities were made available for the movement of such materials. In fact, plant capacities in excess of transportation facilities would tend to reduce, rather than to increase the output of aggregates. Therefore, before the producers of sand, gravel, stone and slag may be consistently asked to prepare for a greater production they must be assured that there will be sufficient open-top cars and motive power to handle the additional output.

Co-operation Necessary

It is apparent that there must be the greatest degree of co-operation between all parties concerned, including producers, contractors, highway departments, private and public consumers and the railroad authorities, if the delivery of materials required to carry on this huge construction program is made possible. In the first place, existing transportation facilities must be employed in the most efficient manner. To this end it is well to consider how each interested agency may help to meet the situation.

What the Railroads May Do

1. Place in service all existing equipment.
2. Keep available equipment repaired to fullest extent.
3. Provide for prompt switching and movement of loads and empties.
4. Purchase new equipment, including both cars and locomotives.
5. Rate plants as to their capacity and distribute cars on that basis without discrimination as between commodities.

What Highway Officials May Do

1. Award contracts in the winter months, so that delivery of materials may begin early in the spring when usually open-top cars are plentiful.
2. Where laws will permit, allow estimates on delivered materials, whether in storage at unloading station or on the site of the job.
3. Award highway contracts in long stretches, so that contractors will be justified in providing equipment for handling materials expeditiously.

What Contractors and Other Consumers May Do

1. Arrange for early and regular delivery of materials.
2. Provide for storage at points of delivery and on site of job whenever practicable.
3. Unload cars promptly, using special equipment when conditions warrant.

What Producers May Do

1. Keep plants in good repair to avoid breakdowns and thus prevent delays in loading.
2. Load cars to maximum capacity.
3. Trace cars to destination and report to proper railroad officials unnecessary delays in movement.

The producers of mineral aggregates are entitled to the same rights and privileges with respect to transportation as the shipper of any other commodity, though heretofore they have been the first to feel the pinch whenever an emergency arose. This is not as it should be and the National Association, through its Transportation Committee, is exerting every effort to bring about a correction of these injustices.

The Transportation Committee is not only making a thorough study of the situation, but it is co-operating with the U. S. Bureau of Public Roads, the various state highway commissions, the producers of other building materials, members of Congress, the Committees on Interstate Commerce of both the Senate and the House, the existing railroad authorities and the Association of Railroad Executives, which latter organization represents 93 per cent of the mileage and the earnings of Class I railroads.

Keeping Track of Orders at the Plants of the Ohio Ballast Co.

System Developed After Experimenting with Card Index and Other Loose-Leaf Methods

FORM NO. 60

Ship To John Doe Team Track Court St. Cincinnati Ohio C. L. & N. RR.

Order № 5968
Date Sept 3-19
Customers No. 1234
Freight Prepaid Collect
Received by Phone Mail or Verbal
Gon or Hopper CARS

Account of Same
Notify Same 911 Broadway Pinti

TONS	CARS	STONE	GRAVEL	SAND	PRICE	TO PLANT NO.	DATE	TONS	CARS	STONE	GRAVEL	SAND
	1	3/4			1.63	O.B	9/3		1	3/4		
	1		1		1.35	C.C.	9/3		1		1	
				Fine	1.40	G.G	9/3		1			Fine

DATE	INITIAL	NUMBER	STONE	GRAVEL	SAND	SHIPPED BY PLANT NO.	REMARKS
9/3	N+W	43971	110000			O B	Ship at once
9/4	P L	701739		115000		C C	
9/5	N y C.	322186			114000	G G	

Above—Form No. 60, used for original entry of all orders
Right—Plant shipping instructions, made out in triplicate

Form No 40 2M K. P Co 8-19.

To O B.

Confirming Order No. 5968
Date 9/3/19

Ship to John Doe

Notify

Account of

Customers No. 1234
Freight Prepaid
Load in Son Cars

TONS	CARS	STONE	GRAVEL	SAND
		3/4		

Remarks. Ship at once

2103 UNION CENTRAL BLDG
CINCINNATI
MAIN 1037

By H Donnelly

BY REASON of our operating several plants, the orders for all of which are handled from the main office, our method of handling these orders probably differs somewhat from that used by the operator having only one plant.

Upon receiving an order, it is entered on Form No. 60, copy of which is shown in Fig. 1. This blank, you will notice, contains our order number, spaces for date, customer's number, freight, i. e., prepaid or collect, received by, i. e., how the order reached the office, class of equipment to be used in loading, to whom the order is to be shipped and charged, and who is to be notified when shipment goes forward. Below this you will find space detailing the order, and to the right of this the plant order was placed with, or what part was placed with one plant and what part was

placed with another. Immediately below this you will find the shipping record of the order, which gives date, initial and number, weight and by which plant shipment was made, and to the right of this a space for remarks.

After the order is received, it is telephoned to the plant which is in position to give the most prompt service. These telephone instructions are confirmed in writing on Form No. 40, copy of which is shown in Fig. 2.

The plant upon receiving the order, enters same on Form No. 70, copy of which is shown in Fig. 3. This form, you will notice, contains space for all information necessary for the plant to fill the order intelligently.

All unfilled or live orders are kept in one binder, and as soon as they are filled they are transferred to another binder. This rule applies to orders at this office, as well as orders at the plant offices, and by keeping his records in this manner the clerk can tell very readily just what orders are unfilled.

We have tried the card index system, and other loose-leaf methods, but find the present method gives the best satisfaction.

The president and treasurer of the Ohio Ballast Co. is D. Donnelly. The vice-president and secretary is Harry Donnelly, president of the National Association of Sand and Gravel Producers. —Contributed by W. A. Jurgensen, traffic manager, Ohio Ballast Co., Cincinnati, Ohio.

FORM NO. 70

SHIP TO John Doyle Team Track Corbett St Cincinnati C. I. & W.

ORDER NO. 5968

DATE 9/3/19

FREIGHT Prepaid

ACCOUNT OF Same

CUSTOMERS NO 1134

NOTIFY Same 911 Broadway Cincinnati

TONS	CARS	STONE	GRAVEL	SAND	REMARKS
	1	34			Gon Car.

DATE	INT.	NUMBER	STONE	GRAVEL	SAND
9/3	N&W	43921	110000		

Plant record of orders received and filled

Sand and Gravel Company's Bonus System Proves Valuable Asset

OWING to the ever increasing difficulty of keeping a steady and willing force of working men, the Beloit Sand & Gravel Co., Beloit, Wis., had added to the wages a bonus system based on production before the beginning of the present season (see ROCK PRODUCTS, January 1, 1919, page 11).

The superintendent receives 20 cents and each laborer receives 5 cents for every carload of material produced. The results have been very noticeable, according to G. A. Rubin, president of the company. The daily production has been increased, without adding to the force of men.

At times it has been found that the men would, of their own accord, divide into two gangs and each work a half of the noon hour in order that the cars on hand might be gotten out.

The men are very much in favor of the new system, because they see how their earnings can be increased by harder work. They do not hesitate to aid a nearby worker, for they know that the lagging of any operation shows up all. Men who are not willing workers are not wanted by the others, because they slow up production. It is stated that during the present car shortage the workmen have been as much concerned as the company officials, for they are anxious to produce and make shipments as the operators.

Sand and Gravel Association Has Engineering Department

FOR THE PURPOSE of developing and extending the use of sand and gravel, the National Association of Sand and Gravel Producers has established an Engineering Department, which will, for the first time in the history of sand and gravel production, specialize in the study and improvement of sand and gravel as building materials, keeping in mind problems incident to production, the requirements of the customer and the public interest.

The Engineering Department will make itself valuable to the organization—

1. By gathering and analyzing information already available concerning the production and proper use of sand and gravel.

2. By conducting tests and investigations of sand and gravel in all fields of use as a basis for writing specifications that will emphasize the advantages of these materials.

3. By conducting tests and investigations of sand and gravel in combination with other materials, such as portland cement, tar, and asphalt as binders for road surface, for the purpose of extending the field of usefulness of sand and gravel.

4. By study and development of the water-bound gravel road to determine the best means for its improvement, particularly in the grading of the size of particles and methods of rolling and compacting.

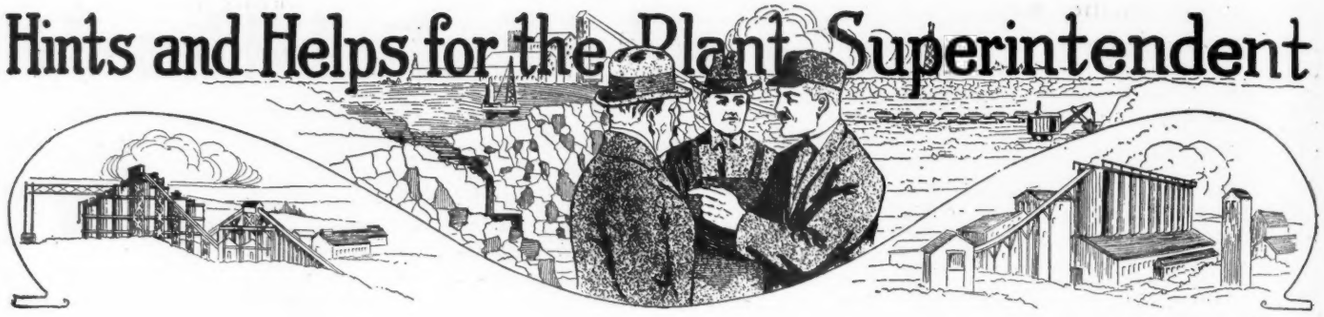
5. By writing and distributing to engineers, universities, and engineering societies, specifications especially designed for sand and gravel, thus directing attention to the proper use of these materials.

6. By keeping before the public the inherent qualities of adaptability and durability possessed by sand and gravel, which places them in highest rank among construction materials.

By doing this work through the National Association, the expense to each producer for handling technical matters would be so small, and the benefit so great, that it would prove to be one of the best investments.

The Engineering Department has already undertaken certain problems in accordance with the above outline. A series of concrete tests has been designed to start the proposed investigation of sand and gravel, the results of which will serve as a basis for specifications and for demonstrating the excellent qualities of these aggregates. An outline and discussion of the series will be published in a later issue.—"The National Sand and Gravel Bulletin."

Hints and Helps for the Plant Superintendent



Opening a Gravel Pit

A NEW JERSEY producer opened a gravel pit and has operated it all season by means of two-horse scraper excavators. This suggests a quick, simple and apparently satisfactory method of opening any new pit, before finally deciding upon the most efficient method of permanent operation. For a moderate overburden it is a good method of stripping.

Operating a New Jersey gravel pit with scraper excavators

Wire Rope Overstrain

A FREQUENT CAUSE of sudden wire-rope breakage is overstrain, and the best rope produced can as surely be overstrained as an inferior rope—not so easily or so soon—but it can be.

There is a point of stretch in a rope called its elastic limit. Up to that point a rope will stretch and upon release from strain will so completely recover that no permanent set is appreciable.

The handling of loads within the elastic limit of a rope may be repeated again and again, but should the strain be sufficient to stretch the rope beyond that limit even once, a part of the steel's vitality is gone and it becomes a set or a dead rope, and, even though sudden breakage may not immediately follow, early deterioration begins.

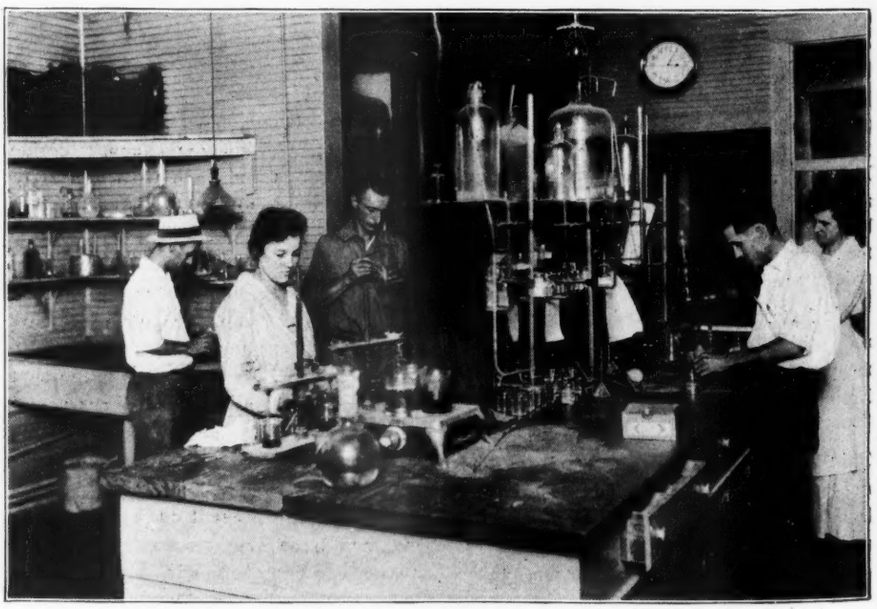
The presence of brittle wires in a failing rope usually points to overstrain. Don't operate a quarry incline or a derrick with an overstrained rope. An ounce of prevention is worth a pound of cure.

Cleaning Drill Holes

A METHOD for removing debris from holes before loading is to place a gas-pipe tripod over the hole, and by means of a rope and pulley lower a section of gas pipe into the hole. By repeatedly raising the pipe several feet and allowing it to drop, it gradually sinks into the debris. Compressed air is then forced through the pipe and blows the refuse out. It the material is too coarse to be blown out, it is first cut up with a steel bar. As the cost of cleaning some drill holes has exceeded the original cost of drilling, all holes recently drilled by one company are cased at the top and carefully plugged.

Women Workers in Cement Plant Laboratory

THE LOUISVILLE CEMENT CO., Sellersburg, Ind., employed women assistants in its cement laboratory during the war because of the scarcity of available young men. This company has found them reliable and efficient workers and much more contented with their lot in life than male laboratory workers; and they are there yet.



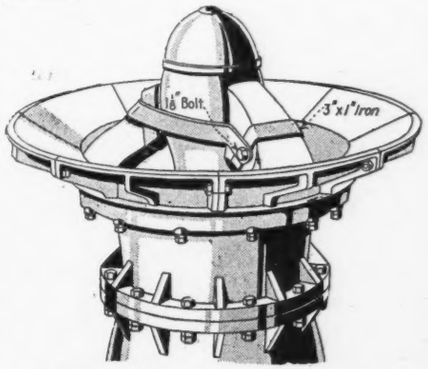
Women laboratory assistants at Louisville Cement Co. plant

Gyratory Crusher Repairs

ROCK BREAKERS are usually designed to stand all the work they are to perform, which is about the hardest service of any equipment in a crushing plant. Wear takes place in the bearings and on the crushing jaws. All bearings are babbitted, and when worn down they must be rebabbitted. Use only the grade of babbitt metal made for that purpose. Many babbitts are either too soft and do not stand the pressure or are too hard and brittle.

In most crushers the crushing jaws can be changed end for end. When worn at one end, which is mostly the lower end, taper bolts must be drawn very tight; and if the jaw plates have a chance to move sidewise it is best to wedge them tight, or, better, pour zinc to keep them in place. If the pitman cap studs break often this is caused by the back toggle being set on the wrong slant. The toggles must point down toward the pitman, and worn toggle and toggle seats must be taken out and overhauled at the machine shop. There must be plenty of head room at the crusher, and a crawl with chain block must be installed even before erecting the crusher. Such an installation will pay for itself at the first repair. Over large crushers it is imperative.

In the gyratory rock crusher a common repair is the babbitting of the eccentric. A special sleeve is always provided, thus simplifying the job. The old babbitt is chiseled or melted off, the sleeve clamped on and the babbitt poured in. As soon as cool, the sleeve is removed and the oil grooves are cut. The concaves must be replaced when worn to a safe limit. To take them out, the first one (which is the hardest) must be shot out with powder by boring a small hole in the zinc. Sometimes blasting can be avoided if by careful examination a loose concave can be found by trying with the hammer, the zinc chiseled off so as to let drive a sharp moil, and then a crowbar used. To put in new concaves, a guide ring is often used, which facilitates the work. If none is at hand, each concave is braced to the head with a strip of wood. Clay softened with oil is used (as in general babbitting work) to prevent zinc from running out. Be careful that no foreign matter drops between the concaves, as it will impair the strength of the zinc and make boiling certain when pouring. The concaves will set tighter if they are heated before pouring.



Gyratory crusher emergency repair

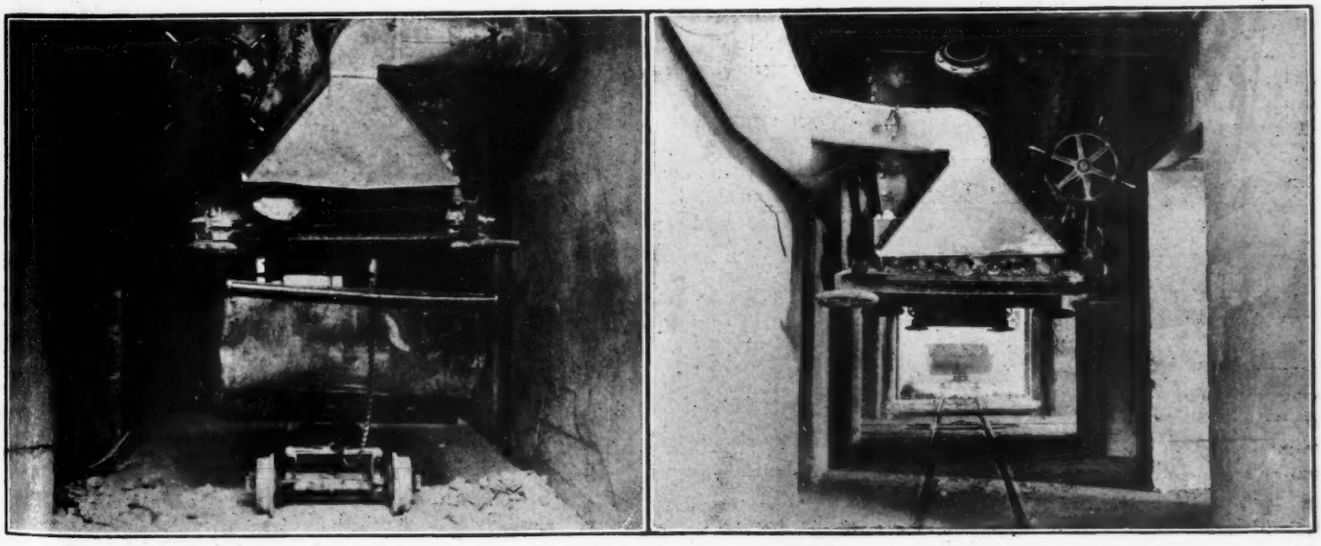
To take up the wear and to keep the crushing uniform, the shaft is raised, but when the lower edge of the crushing head comes above the lower edge of the concaves nothing can be gained. Either the concaves or the head must be changed. To take the head off, it is best to remove the entire shaft to the machine shop, because, as a rule, it is tight, and often the hydraulic press must be used.

In some crushing plants a duplicate shaft is kept with a different head. The one already used is put in when a new set of concaves is placed, and when the concaves are somewhat worn the shaft with the new head is put in. Thus the adjustments for uniform crushing are easy and a head can be changed at the shop when convenient.

A tedious repair is the replacement of a broken shaft; and a broken spider is as bad, if not worse. In this emergency a clamp must be forged in place to fit around one arm near the shaft bushing, another clamp fitted at the lower part of the broken arm, and a strong draw bolt put on each side. But in places where big rocks hit the spider, bolts must be omitted. A piece of flat iron is heated and bent in place around one arm, extending to the lower part of the other arm; then both ends are fastened with a bolt, as shown in the illustration. The heat must be kept on the sides of the clamp while tightening the bolt. In cooling, the contraction brings the broken parts together.—Charles Labbe, in the "Engineering and Mining Journal."

Dust Prevention in Lime Plant

DRAWING A KILN of lime, whether it is hot or not, is an unpleasant occupation. However, it may be made less disagreeable by such an installation as that shown in the accompanying view, taken at the plant of the Palmer Lime & Cement Co., York, Pa. By means of a large suction fan and hood intakes at the drawing cone, as shown, a considerable amount of caustic lime dust is kept out of the atmosphere—and, incidentally, saved. Incidentally, these are the largest lime kilns in the world. Each has four drawing cones like those shown.



Dust prevention and collecting system on lime kil ns of the Palmer Lime & Cement Co., York, Pa.

The Use of Lime in the Paper Industry

Something About Paper Making in General—Uses of Lime in the Soda and Sulphite Processes—Kind of Lime Required

By Martin L. Griffin
North Hope Finishing Co., North Dighton, Mass., Formerly Chief Chemist of the Oxford Paper Co., Rumford, Me.

PAPER, with slight exceptions, is made from the fibrous part of plants; sometimes from the bark, as jute and flax; sometimes from the stalk, as straws and woods; and in one notable instance, from the flower of the cotton plant.

All plants, like people, do some things better than others. Some pay particular attention to the fruit, while others are gay with bright foliage and gaudy flowers, which the bees and birds delight in, and still others triumph in the sturdy stalk, stretching their tops toward the sky where air and sunlight are uncontaminated. These special functions are performed at the expense of others, by which I mean that plants producing fruit and flowers, especially, do not excel in a sturdy, fibrous stalk. The stalk is pithy and nearly useless for paper. This is well illustrated in the sugar cane and cornstalk. On the other hand, the forest tree produces little or no flowers or fruit, while all its value is contained in the trunk.

Early History of Paper

It is well to bear in mind that man has not always enjoyed the pleasures and benefits of paper. Very early records were preserved on stone and earthen tablets. Skins of reptiles and animals, known as parchment, were in common use among the wealthy. We are in the habit of crediting the Egyptians with being the first to make paper, quite probably because of the papyrus plant, from which the word "paper" comes and which grows abundantly along the Nile River. From the bark of this plant they made paper.

The Chinese made paper, perhaps as early, from the rice plant, but unfortunately history does not associate the ideas conveyed by the words "rice" and "paper" as it does with the words "papyrus" and "paper," and so the distinction goes to the Egyptians.

First Use of Lime by Wasps!

I believe, however, that the original idea of paper was first in the mind, if you please, of the wasp. which builds its nest of paper of its own manufacture and essentially in the manner all paper is made. I have never examined the wasp's paper critically to discover what chemical treatment the raw materials received in the process of mastication, but a casual observation would quickly suggest that it had had something to disintegrate and cement the fibres. It may have been lime—probably was, as lime is very essential to the growth of all organisms and animal fluids and excretions are generally alkaline.

Science and progress flow from natural laws and phenomena. It follows naturally that to make paper in which the raw fibres may lose their identity completely, some softening disintegrating treatment must be resorted to, to remove gums, resins, pith and foreign matter. Weathering, which is Nature's process of disintegration, does this slowly, but in our short lives we must do things quickly to reap the reward, and so artificial means must be resorted to.

Lime in Rag Paper Making

Until the discovery that paper could be made from wood, it was made very generally from cotton and linen rags. which in their life history had been scoured and cleansed by wear and, when they finally reached the paper mill, required only a mild cleaning treatment to remove dirt and coloring matter. The cheapest and best treatment to preserve the fibres is to boil the rags in lime water and the use of lime for this purpose has always been a standard practice. If the rags should require a more drastic treatment, it is customary to use some soda along with the lime. The lime used for this work should be of good quality and slaked to a thin milk and run off into the rag boiler, leaving the heavy impurities behind.

When straws are used for making a cheap wrapping paper, a much stronger treatment with lime is customary. Old manila rope and jute stock are largely used for flour and cement sacks and electrical insulation, and these are boiled with lime water. Solutions of stronger alkalies as soda ash or caustic soda would be very injurious to the fibres.

Lime in Wood Pulp Treatment

The greatest use of lime in the paper industry came with the two principal processes for reducing wood to pulp.

The Soda Process, as it is called, is the older of the two and consists in cooking the wood, in the form of chips, in very strong solutions of caustic soda at high temperatures and pressures. This cooking liquor is made by boiling up a solution of soda ash with lime, in the proportion of about 55 to 60 parts of good lime to 100 parts of soda ash. The lime required on the basis of pulp is about 700 lbs. to the ton. Lime for this purpose should be of a high degree of purity, containing not more than one to one and a half per cent of magnesia and low in silica, iron and alumina, which are scale forming impurities and cause trouble and expense in operating the vacuum evaporators.

In the second of the two pulp processes, known as the Sulphite Process, lime or limestone is used as a base with which water and sulphur gas combine to form the acid-cooking liquor. The process consists either in passing sulphur gas into lime water or over limestone in towers over which water trickles.

Use of Dolomite

Ordinary limestone is used to a considerable extent, principally in the tower systems, but magnesium lime from dolomite is used very generally in the limewater systems for acid making. The impression prevails that better pulp, with less possibility of trouble, can be made with the magnesia lime. This, however, is very doubtful. Lime or limestone of a high grade is desirable for this use. About 175 to 200 lbs. of lime are required per ton of this kind of pulp.

There remains one other very important use of lime, closely allied to the paper industry, namely, for making bleaching powder and bleaching solutions.

Manufacture of Bleaching Powder

To make the powder, chlorine gas is passed over hydrated lime till it reaches a concentration of about 35 to 38% available chlorine; to make the solution, the gas is passed through lime water. In both cases the product must be strongly alkaline or the bleach will decompose and be lost.

For this purpose the lime must be very free from impurities of iron, aluminum and magnesium. Sand and silicious matter are not objectionable from a chemical standpoint and may even aid in settling the solution.

It requires about 700 lbs. of lime per ton equivalent when made in solution form for immediate use, and 950 lbs. when made into a powder possessing good keeping qualities.

The use of lime in the process of mak-

ing paper is very old. Lime and limestone are very mild alkalies, often called alkaline earths. Their influence on vegetable fibres is very mild.

Limestone exists in enormous deposits and so universal that most soils and natural rivers are alkaline. It is therefore cheap and easy to obtain.

Possible Substitutes of Lime

It would be possible to boil rags and the tender fibrous barks with alkaline soaps, but it would be very expensive. Borax and sodium silicate (water glass) have sometimes been used to a limited extent but the practice cannot be recommended. All these substances are relatively expensive compared with lime.

With the exception of caustic soda, made by the electrolysis of salt brine, it is all made by the treatment of solutions of soda ash with lime and there is very little prospect of lime being displaced for this purpose.

By the sulphite process, a soda base could be used to make the solution of sulphite, but it would be very expensive and inefficient.

The same holds true in the making of chlorine bleach. Small amounts of sodium hypochlorite are made and used for particular purposes, but lime will never be displaced in the manufacture of bleaching powder.

Thus we may conclude that the manufacture of paper and the burning of lime are very closely associated. Each is fundamental to the welfare and progress of society and as such will be enduring.

Government Gives Up Attempt to Fix Fertilizer Prices

THE DEPARTMENT OF AGRICULTURE made a brief and unsuccessful attempt to prevent a rise in raw fertilizer materials last week. On November 11 an order was issued warning manufacturers that the sale of those materials at prices in excess of those of October 7 would be considered prima facie evidence of profiteering.

The order was withdrawn the following day in the face of an avalanche of protests, many of them from Southern farmers with cotton seed to dispose of. While the order did not apply to agricultural lime and limestone, had it remained in force it would have furnished a precedent for the price control of these commodities as well.

As the case stands now it furnishes a precedent which will prevent the Department of Agriculture from attempting to fix the prices of fertilizer materials which the farmers do not furnish, such as lime, limestone and rock phosphates. The Department of Agriculture claimed authority to act through the Food Control Act, passed as a war measure.

Muscles Shoals Plant May Operate

SECRETARY OF WAR BAKER is said to favor the Government organizing an operating corporation to manufacture nitrate for agricultural purposes at the Muscles Shoals air nitrate plant. This plant represents an investment of $70,000,000 and has been idle and practically abandoned for a year.

A bill creating a $12,500,000 corporation, in which all common and preferred stock is to be held by the United States Government, is to be introduced in the Senate by Chairman Wadsworth of the Military Affairs Committee, at Secretary Baker's request.

The matter is of interest to lime and limestone producers in the South, for the operation of this Alabama plant for the fixation of atmospheric nitrogen would involve the production of large quantities of lime and limestone wastes which undoubtedly would be disposed of for agricultural purposes.

Why We Use Lime and Limestone in Agriculture

IN A RECENT WORK on the chemistry of food and nutrition, Prof. H. C. Sherman, of Columbia University, gives it as his opinion that the ordinary mixed diet of our citizens, at least of dwellers in cities, is probably more often deficient in calcium than in any other chemical element.

Calcium (lime) constitutes 2 per cent of the body weight, so a man weighing 150 pounds has, or should have, 3 pounds of calcium in his chemical constitution. This is contained largely in the bones, which include 99 per cent of the calcium or lime salts.

Man eliminates a certain amount of lime from his system in one way and another each day, and in order to maintain a normal reserve of the element in the body he must ingest a certain minimum quantity of lime in one form or another. The amount of lime required per diem to maintain this reserve is estimated by good authorities as about 15 grains. That amount would be obtained in about 1½ pints of milk. Many other foods contain lime, but not in such ample quantities as milk. For instance, the cereals, the roots and tubers and various meats are rather poor in lime, and these are the foods on which American people, especially in towns, chiefly rely.

An expectant mother, as well as a nursing mother, must consume at least a quart of fresh milk daily if she means to keep herself and her baby in the best of health, for there is a considerable demand on her lime reserve for the development of the baby's bones and later for the secretion of milk.

A pint of milk contains as much lime as seven oranges, three egg yolks, two ounces of cheese, seven ounces of beans, ten ounces of carrots, five ounces of oatmeal, or two ounces of peanuts.

Some competent students of the question advocate the addition of lime carbonate to the salt in the salt cellar for the table and for cooking. Equal parts of powdered calcium carbonate and salt might well be used in this way in households in which fresh milk is not freely supplied for every person.

The physiologist Loeb has shown that calcium or lime diminishes nervous irritability, and clinically we believe lime salts produce a sedative effect in many nervous disorders.—Dr. Brady, in the "Chicago Daily News.

Monumental Granite Quarry Industry Grows

THE PRODUCTION of granite for the manufacture of monuments is an industry of considerable importance in the United States, and is increasing in importance every year. While this industry might be regarded as non-essential in the prosecution of the recent war, there is probably no industry thus classified that suffered less during the war period. While there was a considerable falling off in orders, operators were enabled to maintain their organizations and to conduct operations approximately on a normal footing. The most serious interruptions have taken place subsequent to the signing of the armistice and were occasioned by strikes.

The granite industry in the neighborhood of Barre, Vermont, suffered a brief tie-up in August through lack of hydroelectric power occasioned by a severe drought in that neighborhood. The plants are now in full operation and for the first time since the war conditions in the Barre district may be regarded as normal. The volume of production is so great that approximately 30 cars a day will be required until December to handle all necessary shipments.

Business is very active in the Quincy, Mass., district, and the abnormal strike conditions that prevailed during the early part of the year are almost overcome. There was a steady increase in production during July, and August was the best month since the war.

At Keene, N. H., and Milford, Mass., quarry production can scarcely keep pace with the demand for finished stock.

Similar conditions of prosperity prevailed in the St. Cloud district of Minnesota. It is estimated that for the present year there will be a 25 per cent increase in volume of production over last year's figures.—Oliver Bowles, U. S. Bureau of Mines, "October Reports on Investigations."

The Hydrated Lime Plant at Genoa, Ohio of the U. S. Gypsum Company

Special Features of a 200-Ton Lime Plant for Making High Grade Finishing Hydrate

By Curtis F. Columbia, C. E.
Industrial Engineer, 205 West Monroe Street, Chicago, Ill.

THE lime plant of the U. S. Gypsum Co. plant is located a half mile southeast of Genoa, Ottawa County, Ohio, which has been a lime producing center for over 60 years. In very early days the settlers recognized the purity of this deposit and in a crude way commenced burning the lime in small kilns. This was the beginning of the industry for the State of Ohio and from this small start, the quality of the lime manufactured, spread its fame over an increasing territory. Soon the crude methods were abandoned as newer processes and more improved products were produced.

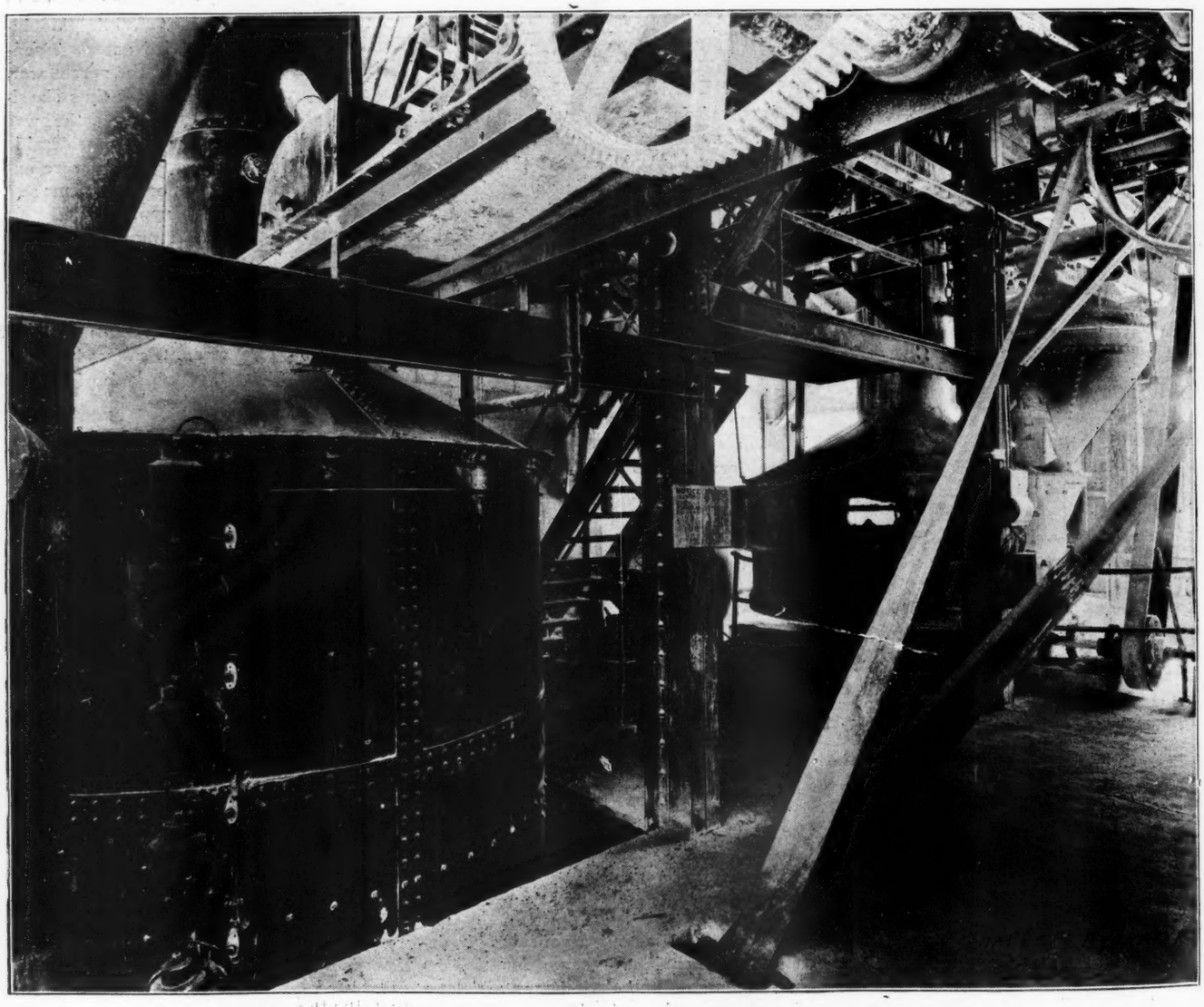
The deposit of limestone which is used in supplying the raw material for this plant are the famous upper beds of the Niagara lime deposits. It is of great thickness and has peculiar properties of purity from which an exceptional quality of white, cool-working hydrated, finishing lime is made. This bed is a true dolomite, having an exceedingly high carbonate of magnesia content.

High calcium limes slake rapidly on the addition of water, and evolve much heat during slaking. Magnesian limes slake more slowly and evolve comparatively little heat during the slaking. Magnesian limes are very much stronger in long-time tests and will carry much more sand.

The following chemical analysis is the average for the entire bed:

	Pct.
Calcium Carbonate	54.78
Magnesium Carbonate	45.07
Iron and Aluminum Oxide	.72
Silica	.26

This analysis shows an almost ideally pure dolomite. The purest possible rock



Interior view of lime hydrating plant of the U. S. Gypsum Co., at Genoa, Ohio

would run about 45.7 per cent magnesium carbonate which commercially is never attained.

Quarrying

The dolomite is extracted by the open pit method. The stone is secured by deep hole drills. Drilling equipment is of the well drill type. Industrial tracks in the quarry bring the stone in 1½-ton dump cars, to within reach of a traveling gantry crane. This crane handles the stone and also unloads coal from the cars. The crane is of the long-boom type and spans the railroad track, allowing cars to pass under without interruption. (Fig. 1) This enables the single crane to serve the entire battery of kilns of which to date there are a total of 17. The limestone rock comes from the quarry in suitable size for burning in the kilns.

Plant Proper

The buildings for housing the equipment are constructed of steel and reinforced concrete. The kilns rest on massive concrete foundations and the floors are concrete throughout. Railroad standard gage tracks are laid on each side of the plant proper. Coal is received on the quarry side, while the finished products are shipped from the opposite side.

Burning in the Kilns

At the present time 17 kilns of the Arnold type are in use. They are arranged to fire from both sides and the burnt stone is removed at a level below the firing floor. These kilns have a capacity of 200 tons in 24 hours. The process of burning consists of heating

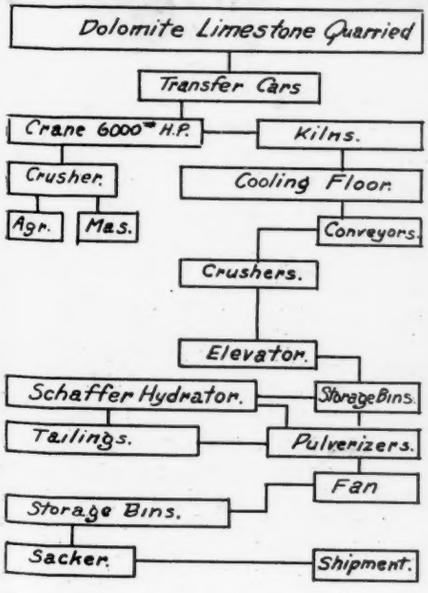
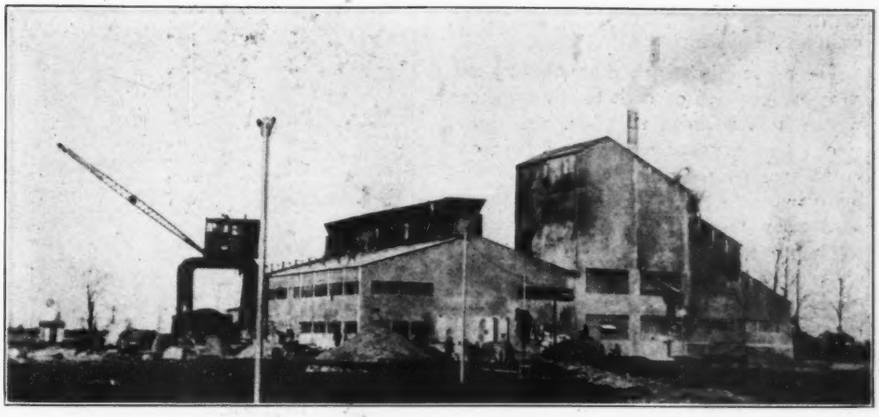


Fig.- Flow Sheet.

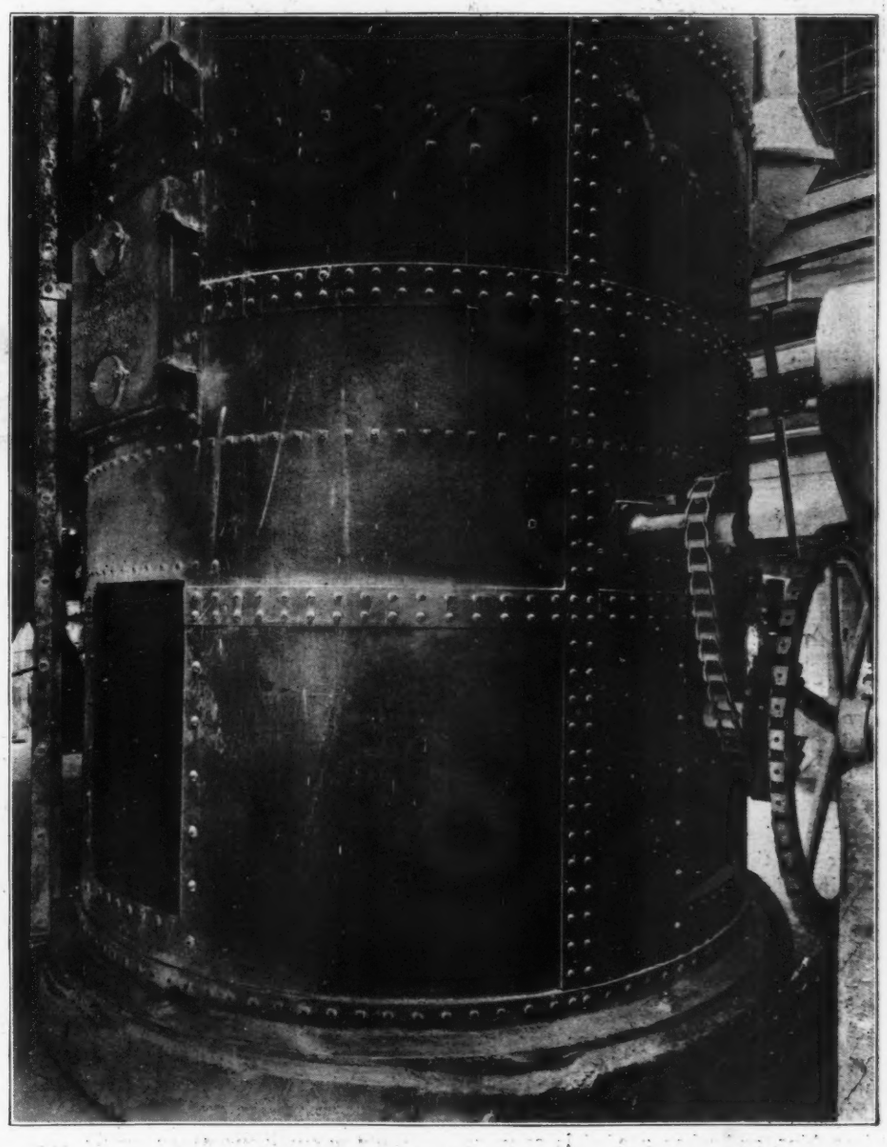
Fig. 5. Flow sheet from quarry to finished product



Genoa lime plant of the U. S. Gypsum Co., showing unusual kiln-feeding method

the dolomite sufficiently to break up the chemical formation, driving off the carbon dioxide gas, leaving as a residue oxide of calcium and magnesium, commercially known as lump or quicklime. This quicklime is drawn off at the bottom of the kilns and allowed to cool and "hard-heads" or unburned cores removed and returned to the kilns for further burning.

Provision was made for further extension and additional kilns have been



Close-up of Schaffer hydrator

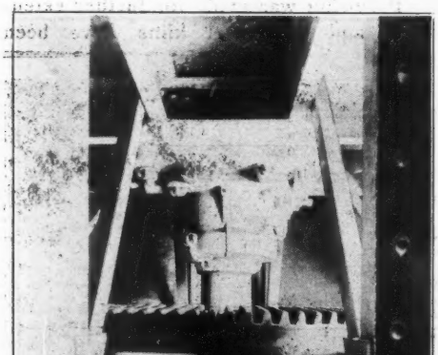
added from time to time as conditions warranted.

The cooled lime is then handled by belt conveyors which carry it to the crushers, where it is reduced to ¼-in. and under size. This crushed material is then elevated to air-tight steel tanks which feed by gravity to the hydrating machinery.

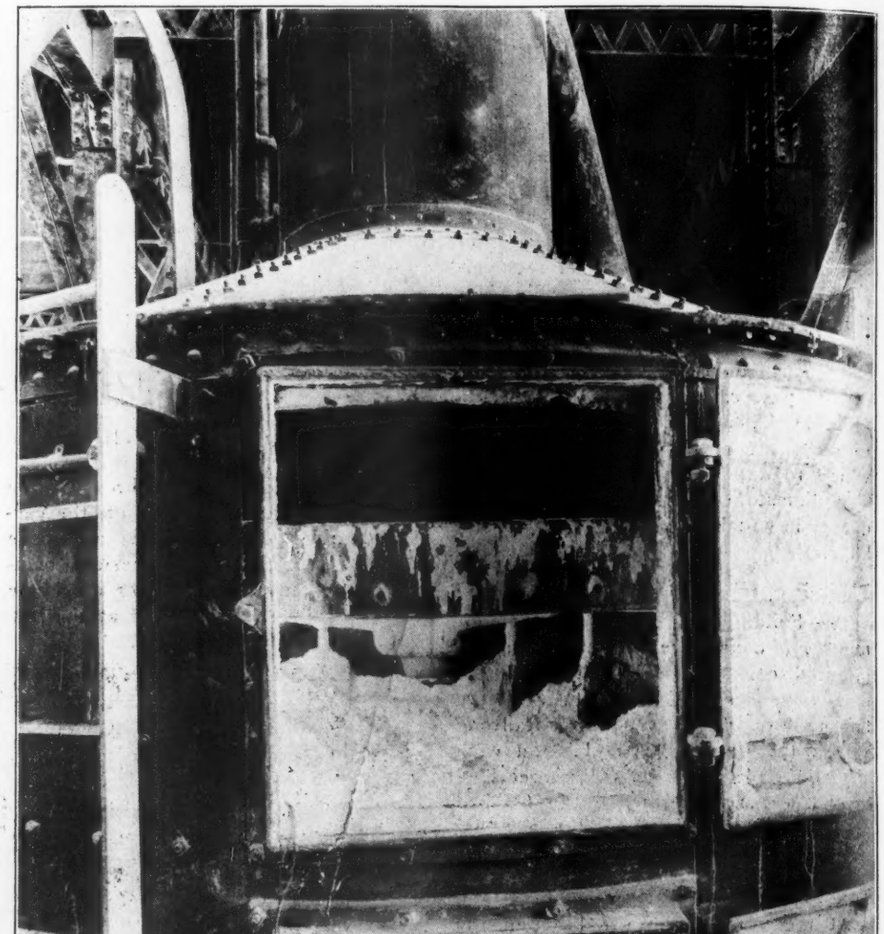
Hydration

The next step is hydration, which consists in the admixture of a definite weight of water and a definite weight of quicklime and agitating, thoroughly mixing the lime with the water. (Fig. 2) Two kinds of hydrators are used at this plant. A five-ton Clyde batch hydrator was originally installed and is now used as auxiliary equipment. Schaffer continuous hydrators are the type now used (Figs. 3 and 4) to hydrate the large quantities of lime required at present.

The pre-determined weights and proportions of materials are delivered to the hydrating equipment accurately and automatically by means of the Schaffer poidometer.



Bevel gear drive of hydrator



Interior of Schaffer hydrator at work

The water content, which must be equally measured with accuracy, is controlled by a measuring device, the water being supplied from an overhead tank equipped with a constant level float.

Crushers

From the hydrators the lime is conveyed to the pulverizing machines, consisting of Raymond mills, which is an air separation device for picking up the hydrated lime, and particles which for any reason have not been properly hydrated and consist of inert material are rejected. The capacity of this machine is from 10 tons to 15 tons per hour. These pulverizing machines reduce the lime to an unpalpable powder, 97 through 100 mesh, which is stored in air-tight iron bins, and when needed is conveyed to the packing department where it is put in paper or jute bags by automatic Bates bagging machines.

The process of making the hydrated lime can be summed up the flow sheet shown in Fig. 5.

The Hydrating Action

There are four essential steps necessary in order to produce a satisfactory hydrated lime. These are:

1. The delivery to the hydrators should in all cases be constant and weights accurately measured.

2. The addition of water in proper quantities and should immediately come in contact with all particles of quicklime.

3. At a certain stage during the hydrating process the quicklime must be subjected to conditions under which it can not throw off its moisture.

4. Cold air must in no case come in contact with the quicklime at certain stages in the process of slaking.

About one-half the weight of the limestone ($MgCO_3+CaCO_3$) charged into the kilns is driven off as carbonic acid gas and to the residue or the quicklime ($CaO+MgO$) sufficient water is added for complete hydration. $Ca(OH)_2$. This means that 100 lbs. of limestone will make 50 lbs. of quicklime or 75 lbs. of hydrated finishing lime.

Hydrated lime is gradually replacing lump lime for many purposes. Lump lime is most inconvenient and dangerous to handle and very uncertain in its results. This has for many years been realized, but it has only been recently that any extensive effort has been made to provide a more satisfactory article for the contractor or builder. It seems probable, therefore, that increased knowledge of its valuable properties and increased care in its preparation will result in a great extent of its production and a corresponding decrease in the amount of lump lime marketed in the unhydrated form.

The Computation of Screen Areas in the Design of Crushing Plants

An Example Illustrating the Application of the Formula Given in "Rock Products," October 25, 1919, Page 19

By Brownell McGrew

THE FORMULA: $A = N\left(\frac{B}{R} \text{ plus } 1\right)$ or, area of screen section required (in square feet) equals the number of tons per hour to be screened through the section times the quantity $\frac{B}{R}$ plus 1, where B is the maximum ring size passing through the barrel of the screen, and R is the ring size to be passed through the section.

As an example, suppose that it is desired to pass 200 tons per hour through the screen, or screens, of crusher-run, the bulk of which will pass through a 6-in. ring; and that the following sizes are to be separated in the screen: 1½-in., 3-in., 6-in., and rejections, or oversize.

The gradation line for this material shows that approximately the following tonnages may be expected:

1½-in. and under.....44 tons per hour
3-in. to 1½-in.....40 tons per hour
6-in. to 3-in.....90 tons per hour
Rejections .....26 tons per hour

We will assume that two 48-in. screens are to be employed, and will apply the formula on that basis. First the calculation for the 1½-in. stone:

The ratio B:R for this material is 6:1½ or 4:1, and the formula would read: $A = 44\left(\frac{4}{1} \text{ plus } 1\right) = 44 \times 5 = 220$ sq. ft. of section.

For the 3-in. stone the ratio is 2:1, and the formula would read: $A = 40\left(\frac{2}{1} \text{ plus } 1\right) = 40 \times 3 = 120$ sq. ft. of section.

For the 6-in. stone the ratio is 1:1, and the formula would read: $A = 90\left(\frac{1}{1} \text{ plus } 1\right) = 90 \times 2 = 180$ sq. ft. of section.

A 48-in. screen has about 12.5 sq. ft. of section area per foot of screen length. Therefore, about 17 lineal feet of section would be required for the 1½-in. materials—say 8 ft. for each of the two screens, as this length can be made up of two 4-ft. sections. The 3-in. material would require about 10 lineal feet, or a 5-ft. section in each screen. The 6-in. material would require about 14 lineal feet, or 7 ft. in each screen. Thus it will be seen that two 48-in. by 20-ft. screens will take care of the separation.

In the above calculation, which is given merely to illustrate the application of the formula, no allowance was made for the return of the rejections through the same screens. As a matter of fact, in this particular case, the amount that would be returned is too small to affect the calculation seriously, as the formula will give an ample margin to cover any slight differences in tonnage.

In Regard to Dust Jackets

A word of warning is in order regarding the use of the formula for calculating dust jacket areas. The screening efficiency of a screen jacket is materially modified by two things. In the first place, if the barrel of the screen is running at the proper peripheral speed it is evident that the jacket will be running at a speed considerably above that which experience has shown will give the highest efficiency. Secondly, the action of the jacket differs from that of the sections in the barrel, in that the jacket does not receive all of the material, which it is to separate, at or near its upper end, the stone dropping to it along the greater portion of its length.

Another important fact, affecting fine screening separation with either the jacket or with sections in the barrel of the screen, is the impossibility of figuring with any degree of accuracy the amount of fine screenings that will be made by the crushers, or the amount of dust, dirt, and fine spalls that will come in from the quarry.

For instance, suppose that it is desired to take from the 1½-in. material, in the above example, the stone under ½-in. ring. From 15 to 20 tons per hour of this size may be expected, providing that the stone coming in from the quarry is reasonably clean. Here the ratio B:R would be 3:1. To compensate for the element of excessive peripheral speed we will calculate the jacket area on the basis of a 48-in. diameter, or the same as the barrel of the screen. The formula would read: $A = 20\left(\frac{3}{1} \text{ plus } 1\right) = 80$ sq. ft. of section. At 12.5 sq. ft. per lineal foot this would give 6.4 lineal feet of jacket—something less than half of what would be required to do the work. Assuming that the 48-in. basis of calculation has taken care of the overspeed, the balance of the obvious discrepancy can be ascribed to the way that the jacket receives its material. For the screens in the above example the writer would install on each one a jacket 7 ft. in length, leaving a 12-in. space for the chute to receive the 1½-in. stone.

In view of the above, it is evident that two measures must be taken to apply the formula to dust jackets for fine screening: (1) Make the estimate of the amount to be handled through the perforations high enough. (2) Adjust the formula to compensate for the two peculiarities inherent in the action of the jacket. For the second measure, the following will give good results: First assume in the calculation that the jacket is of the same diameter as the barrel of the screen. Then modify the formula to read:

$$A = 2.25\ N\left(\frac{B}{R} \text{ plus } 1\right)$$

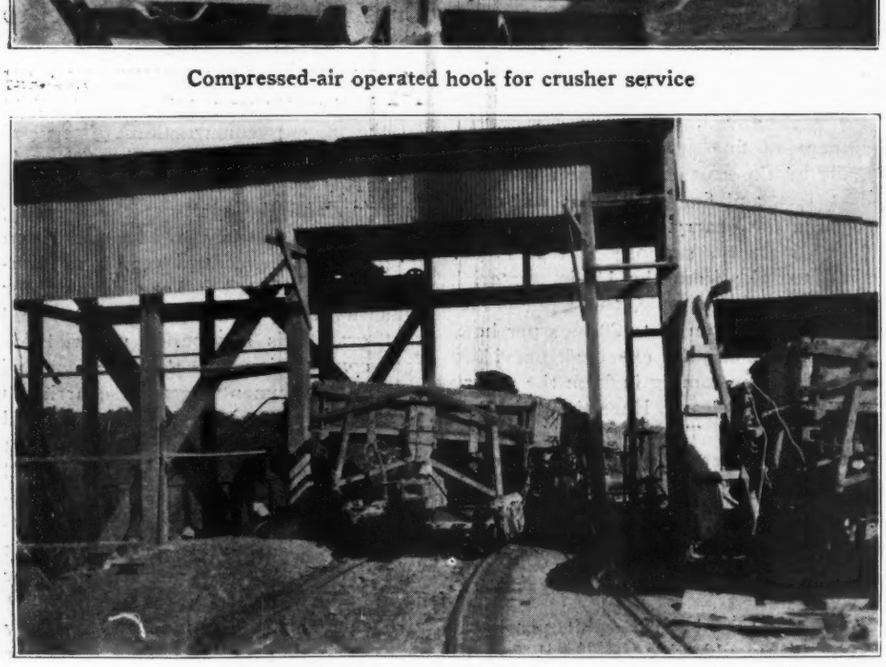
The constant 2.25 could be altered so that the jacket might be figured for its true diameter and area, but the method given accomplishes the same result and is simpler and quicker in its application.

Crushed Stone Important to Granite Industry

AN IMPORTANT DEVELOPMENT in the St. Cloud, Minn., granite field is the recent construction of several large crushing plants to utilize the great heaps of waste granite at the various quarries, and the spalls at the finishing plants. The extensive road construction program in the central region of Minnesota has created a keen demand for crushed stone, and it has been found that granite is a superior material for road construction. As the percentage of waste at monumental granite quarries is unusually high, granite producers should constantly bear in mind this important problem of waste utilization, and full advantage should be taken of every opportunity that may arise for the profitable disposal of waste heaps that not only represent a vast amount of labor from which no profit is gained, but also encumber the ground and in many instances impede operations.—Oliver Bowles, U. S. Bureau of Mines.

Panorama of the quarry and crushing plant of the Connecticut Quarrie

Compressed-air operated hook for crusher service



Quarry cars dumping at initial crusher

Remarkably Eff t Q

Middlefield Plant of the Con Quarrie

THE SURROUNDING VIEWS illustrate pe as efficient a quarry and crushing-plant l as it is possible to attain in ordinary practice. quarry is on the top of a trap-rock mountain the crushing plant was so located as to gi average quarry working face of from 50 to 7 and yet was so arranged as to give practica gravity crushing and screening operation. A bucket elevator is used to take the stone fro primary to the secondary crushers and two belt conveyors take the stone from the seco crushers to the screens.

The quarry face is now in the form of a arc or horseshoe, so that the quarry track is tically a circle or continuous loop. There are switches in the outside track, three of them s in the view above. These, with the sidings cut-off tracks, permit two shovels to work i quarry without interference of trains, or permit one part of the quarry to be worked while the other is blasted. The cut-offs permit an empty or a loaded train to take the shortest route to the plant, or to the shovel, without traveling the whole outside circuit.

One dumping track is provided above the primary crusher, side dump cars being used. A second track for bad-order cars or extras is provided on the quarry side.

The operating method is very simple. The track is practically level the whole circuit. One steam dinky can handle five or six loaded cars. The locomotive picks up a

Alb orthen, ident

Quarries, Middlefield, Connecticut, showing exceptionally efficient track layout

Eff t Quarry Layout

ne Con Quarries Co. Has Ideal Location

strate pe ring of loaded cars at the shovel and hauls them r-plant l ound the circuit to the left, as shown in the view. practice. n reaching the plant the locomotive is uncoupled nountain om the loaded cars and pushes the empties out in s to gi ont of it to the shovel, or it may of course take 50 to 7 e siding around the empties and couple on ahead. practica A car-puller hoist spots the loaded cars at the ion. A usher, while the locomotive takes the empties out one fro the shovel and picks up another string of loaded nd two rs. One locomotive can thus handle three trains he seco d keep both the shovel and crusher busy. The rs at the shovel can be spotted by shoving them m of a ith the shovel dipper.

rack is The main crusher is a 36-in. gyratory and is lo-here are ted under the roof at the left of the panorama them s ove. It is set a little below the quarry floor level. sidings r loosening boulders and facilitating the handling work i large chunks of stone the compressed-air operated hoist, shown in the view on the left is used.

The Middlefield plant is one of the five trap-rock crushing plants and quarries operated by the Connecticut Quarries Co. of New Haven, Conn. The president of this company is B. D. Pierce, Jr., a vice-president of the National Crushed Stone Association. The vice-president in charge of operation is Albert L. Worthen, the treasurer, Arthur S. Lane and the secretary, Irving S. Tinker. The other four plants are located at Meriden, Rocky Hill, Plainville and Mount Carmel, Conn. The Mount Carmel plant was described in ROCK PRODUCTS April 26, 1918, p. 29.

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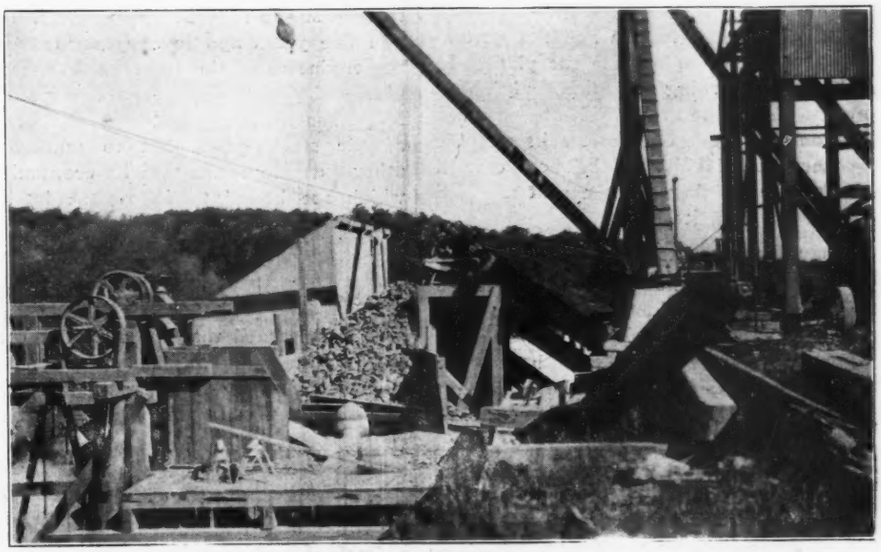
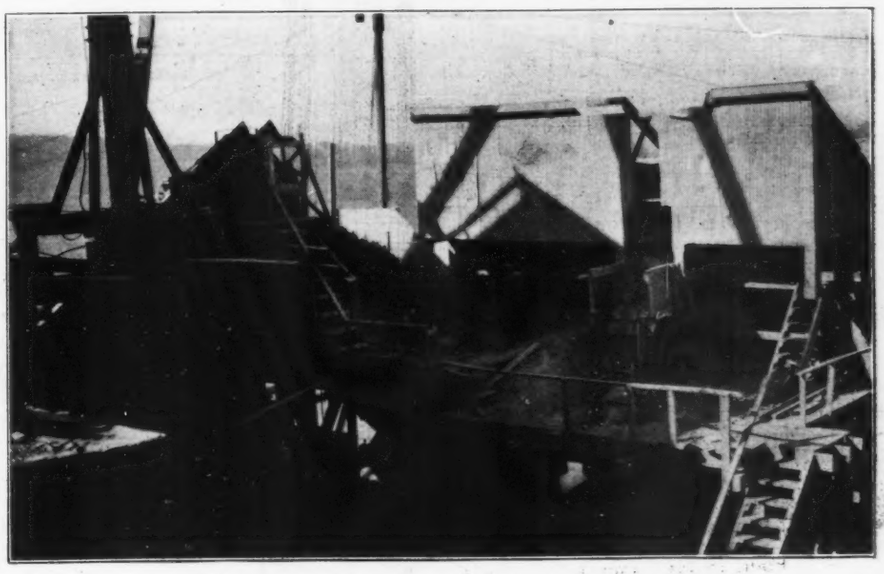


Location of secondary crushers below the primary breaker



Another view of the battery of secondary crushers

Louisville Cement Company Leads in Waste-Heat Utilization

One of the First in the Field and Constantly Devising Improvements

THE STRIKE of the bituminous coal miners and the practical certainty of still higher prices for coal, focuses renewed attention on fuel conservation. In very few industries does the coal bill cut so large a figure in the cost of the product as in the manufacture of portland cement and lime. Hence it behooves cement and lime manufacturers to keep abreast of the times in matters of fuel economy.

It is fairly well known that only about 50 per cent of the actual fuel energy of the coal burned is utilized in the manufacture of portland cement—including both the kiln operation and the generation of power to operate the plant. In the actual burning operation, only about one-third of the available heat is utilized—one-third goes out the stacks and the other third is lost in the heat carried in the hot clinker and the heat radiated from the kiln itself.

Early Experiments

Previous to the installation of the waste-heat utilization plant at the mills of the Louisville Cement Co., Sellersburg, Ind., some progress had been made at the mills of the Cayuga Lake Cement Co., the Kosmos Portland Cement Co., the Sandusky Cement Co., and the Burt Portland Cement Co., but the Sellersburg plant was the first to have a specially designed boiler, and under H. D. Baylor, chemist, now superintendent also, was perhaps the first to do practical research work in solving the waste-heat recovery problem.

W. S. Speed, president of the Louisville Cement Co., has initiated in the cement industry a study and development in fuel economy such as already has made great progress in boiler plants of power companies. The solution of this waste-heat recovery problem, begun five years ago in conjunction with the engineers of the Babcock & Wilcox Co., boiler manufacturers of Bayonne, N. J., has led not only to the utilization of the stack gases, but to numerous other developments and economies, which are bound to follow the intelligent working out of the problem at any plant.

More Heat for Coal Burned

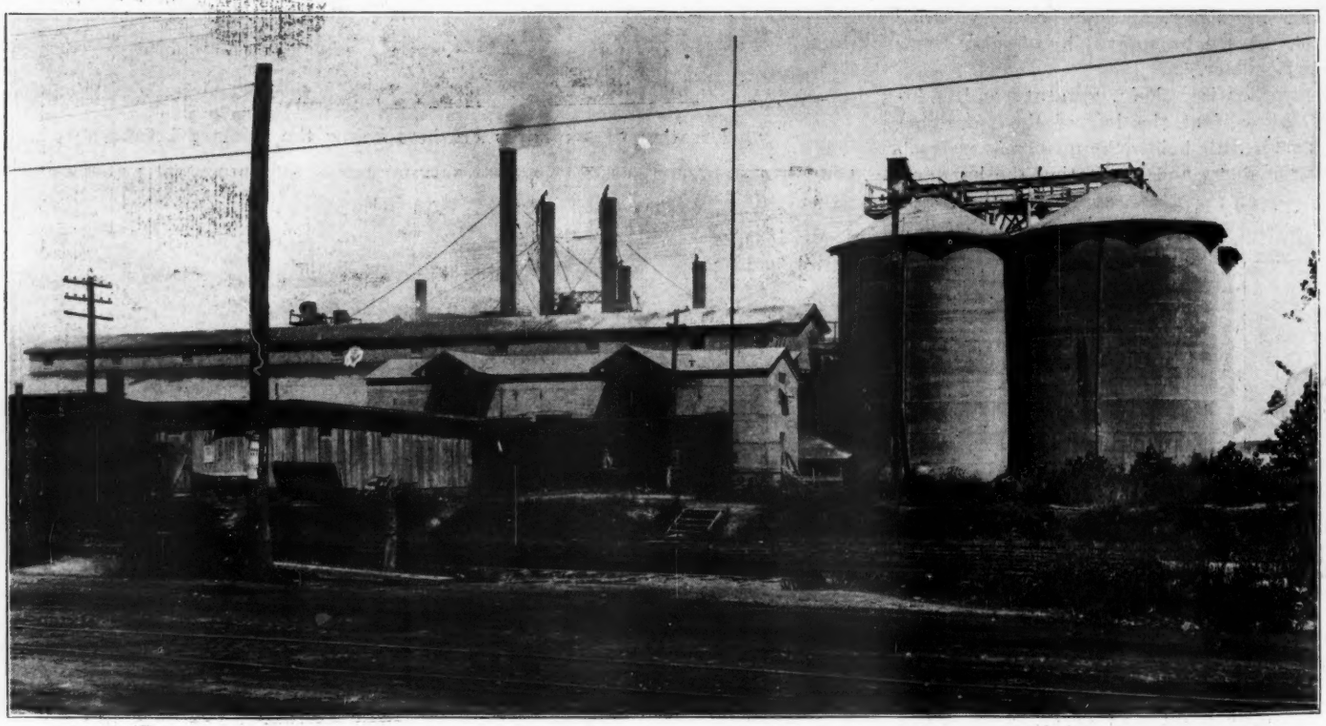
It was learned that the irregular coal feed on the kilns was a source of considerable heat loss. It was found that twice as much air was being admitted and heated as was required for combustion of the pulverized coal.

The coal feed difficulty was overcome by a rearrangement of the coal feeding hopper to avoid a banking of pulverized coal in the hopper. The excess of air for combustion was largely overcome by the building of a large air manifold on the kiln hood, and by arranging to draw heated air for combustion from the hot discharged clinker. Now fully 75 per cent of the air used in the kiln enters at a temperature of 350 deg. F.

Another problem that was solved incidentally was draft control on the kilns by use of the large induced-draft fan required for the recovery of the stack gases. Mr. Baylor says that this alone was worth while because cement plant engineers seldom agree as to size and shape of kiln stacks; but with the variable speed fan, each engineer or plant superintendent can get just the draft that best suits his conditions.

Special Waste-Heat Boilers

The first installation consisted of a B. & W. waste-heat boiler having a rated horsepower of 1500, with 15,300 sq. ft. of heating surface and 1382 sq. ft. of superheating surface. Owing to the



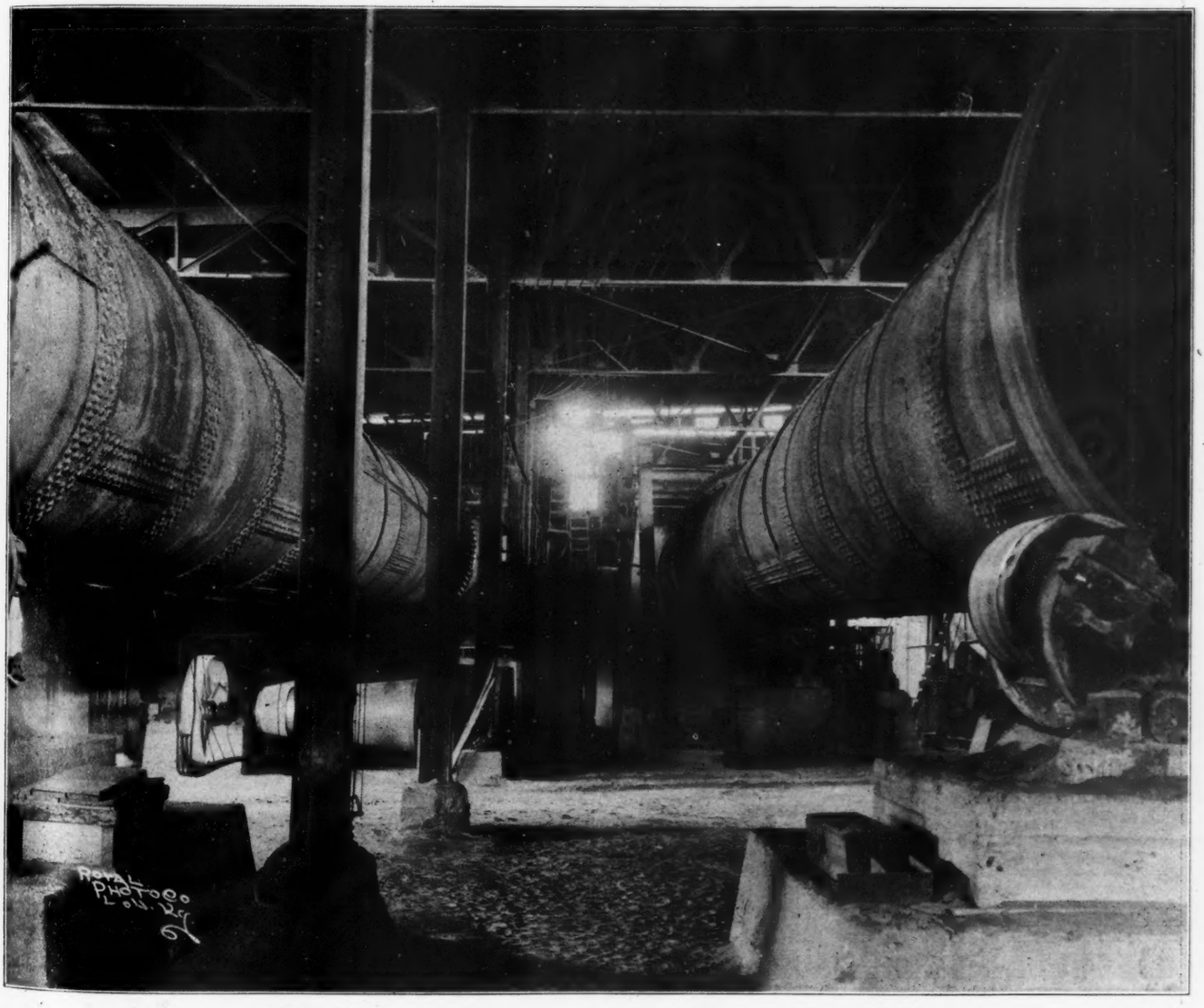
Plant of the Louisville Portland Cement Co., Sellersville, Ind., showing storage bins for cement

tendency of the dust to collect in the superheater, and the difficulty in removing it, one-half of the tubes or heating surface were removed, leaving 691 sq. ft. of superheating surface. This boiler was fed by gases from two 10x150 ft. kilns by a steam-turbine driven fan, which consumes about 135 h. p.

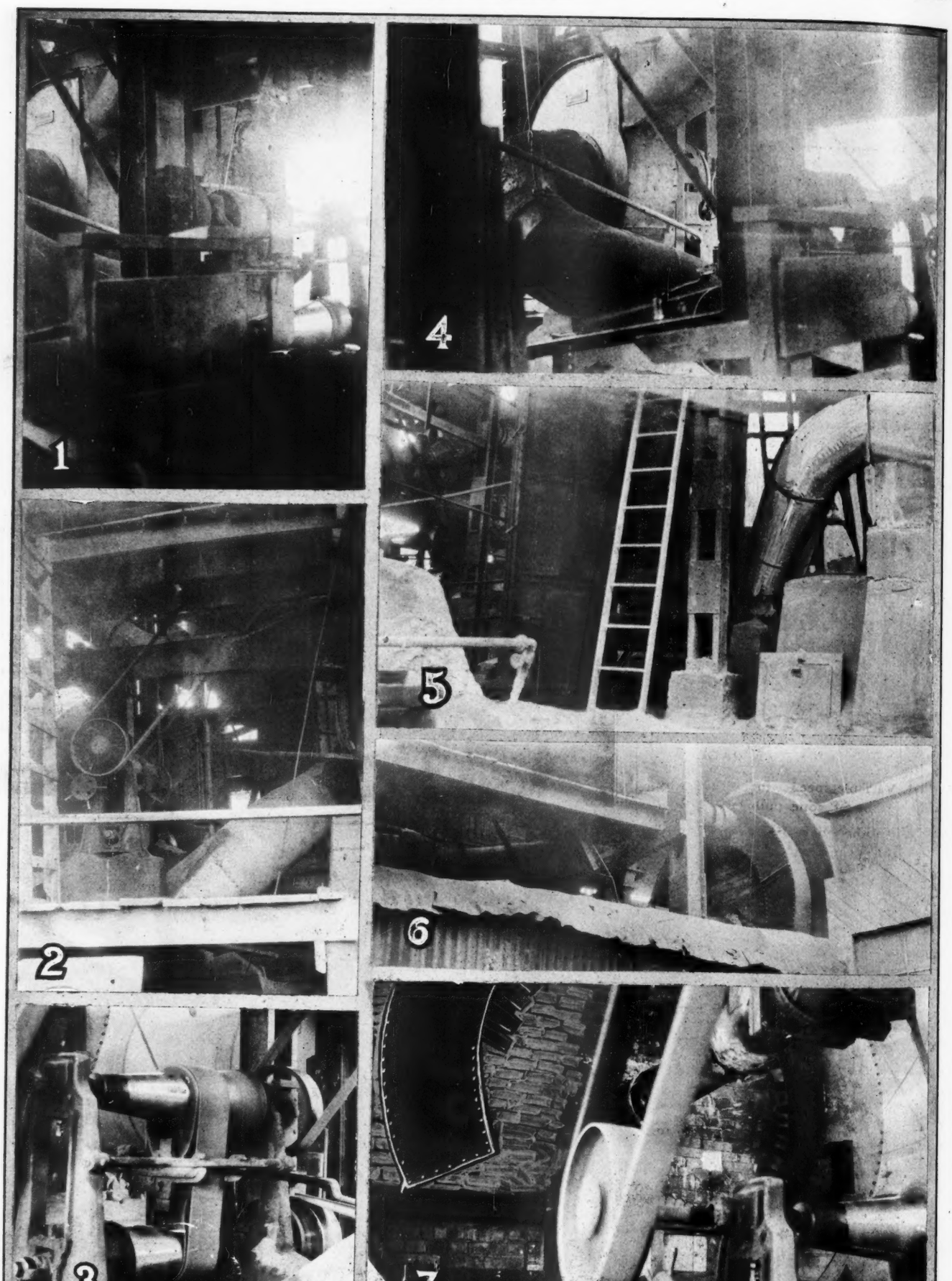
The gas from the kilns is drawn through a very large conduit which acts as an expansion chamber and reduces the amount of dust. Nevertheless the dust accumulation is such as to require the boiler tubes to be blown off with superheated steam once in every 24 hours. The removal and recovery of this dust was one of the problems solved in the second boiler installation. This boiler is mounted well above ground level to permit the placing of large dust settling chambers under the boiler, and of a screw conveyor for automatically cleaning out the hoppers.

The second boiler is also set much closer to the kiln discharge to eliminate a part of the loss from friction and reduction in temperature. The fan for the second boiler installation is of the turbo-vane type, instead of the radial vane type used with the first boiler, which gives a

Potash recovery plant in foreground, showing pipe for taking gases from top of waste heat boilers



Kiln room, showing variable-speed drive by means of cone pulleys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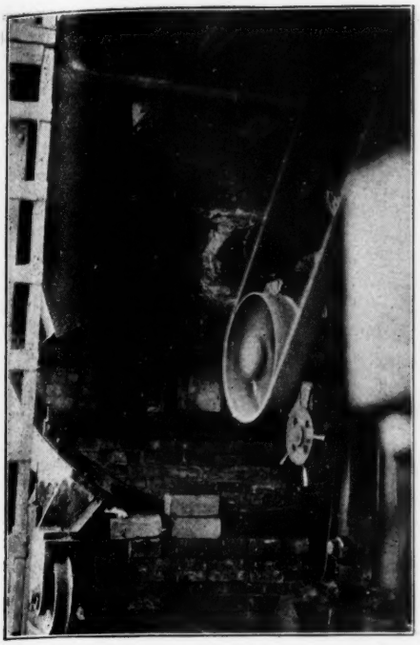
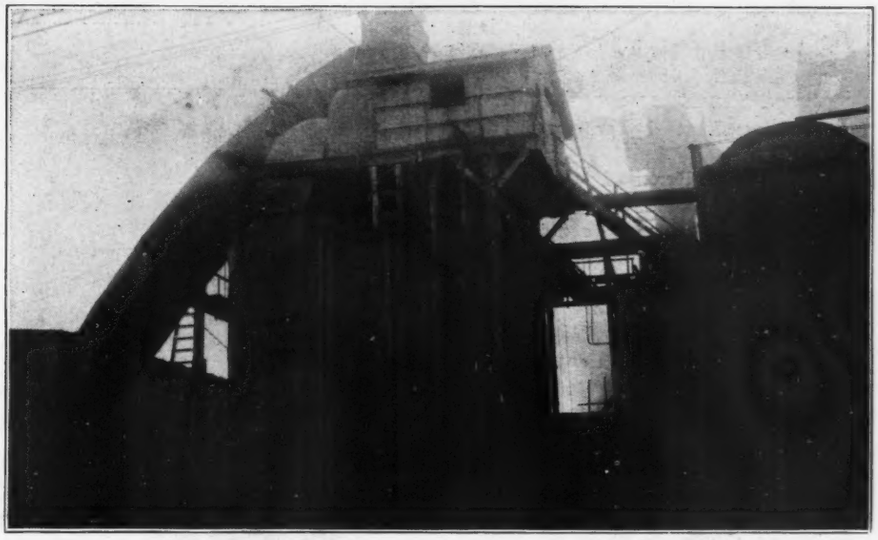


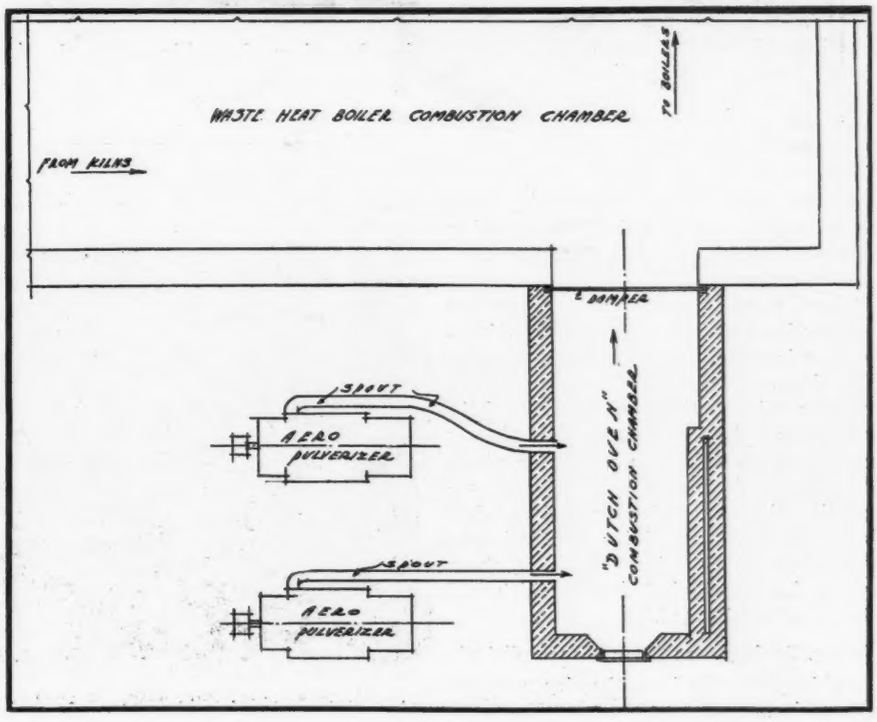


Above—Kiln, showing pulverized coal burner and air intake manifold.

To Right—Two views of the first waste-heat boiler installation, the upper one showing the large expansion chamber for settling out dust before reaching the boiler.

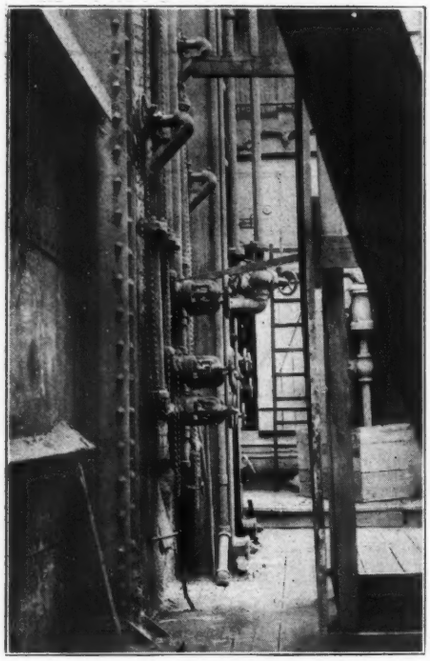
ON OPPOSITE PAGE

1. Variable-speed fuel feed by means of cone pulleys.
2. Another view of fuel feed mechanism and pipe for air intake from hot clinker.
3. Mechanism of cone-pulley fuel feed.
4. Suction fan and hot-air intake.
5. Another view of air intake.
6 and 7. Manifold air inlet on hoods of kilns required because of intensity of flame at given point, resulting from usual intake



To right—Method devised for auxiliary firing of waste-heat boilers.

more economical power unit. This gain however is offset by the dusting up of the vanes and their frequent cleaning. The newer boiler receives the gases of two kilns 8x125 ft., and gives a net boiler horse power of 500.



Latest waste-heat boiler installations

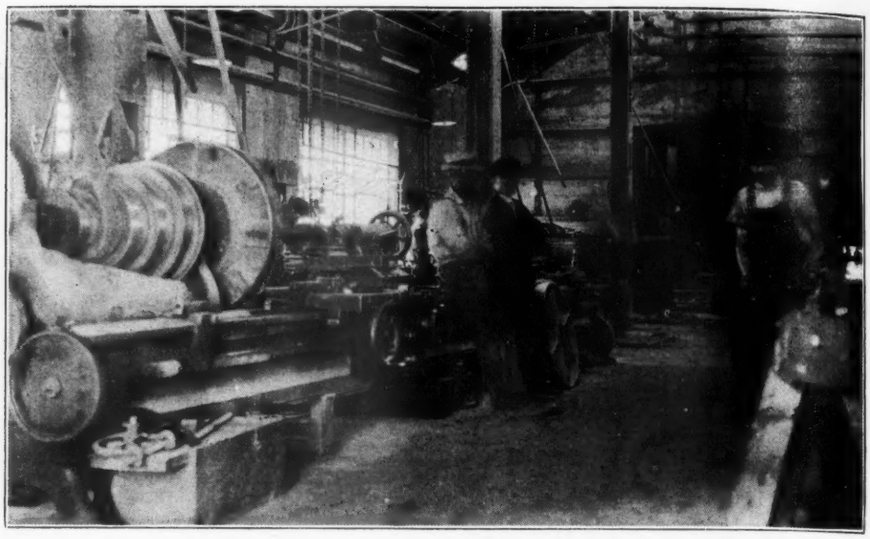
Auxiliary Power Required

Because it appears to be practically impossible to operate a cement plant without the possibility of causing great fluctuation in the temperature and volume of the waste gases, through cutting out one or more kilns, Mr. Baylor found that it was not possible to entirely eliminate the use of the boiler plant previously used for power, even when the waste-heat boilers were capable of developing all the power required. It was still necessary to keep fires under two or more of the power-plant boilers to supplement the steam from the waste-heat boilers when a sudden reduction in the heat of the stack gases should occur.

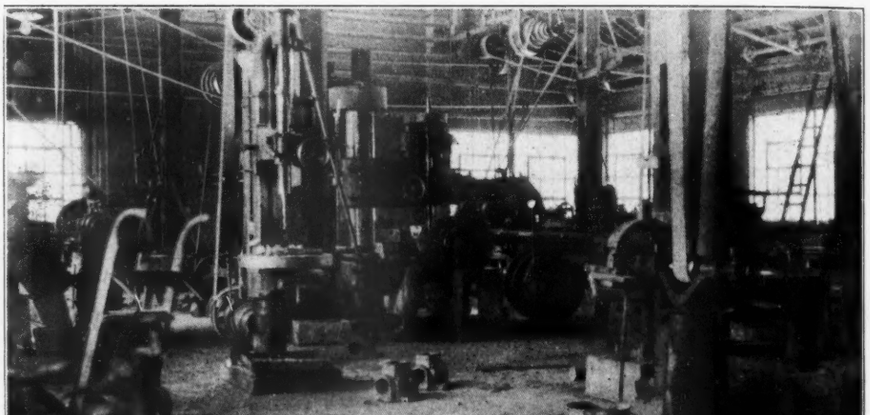
This involved a certain waste of fuel which the engineers of the Louisville Cement Company have been giving their most recent attention. The result of these studies is the dutch-oven combustion chamber with two Aero coal pulverizer feeders, shown in the accompanying sketch. The purpose of this is to supplement the hot gases to the waste-heat boiler instead of supplementing its steam supply from an independent source. This device is still in an experimental stage. Writing under date of November 4, Mr. Baylor said: "While we have not fully tested out this scheme, we feel that it will be a great help in our boiler plant, as it offers the means of immediately replacing the heat under the boilers when any of the rotary kilns are suddenly thrown out of service. However, there are a few mechanical details which will have to be changed."

What Saving Has Been Accomplished

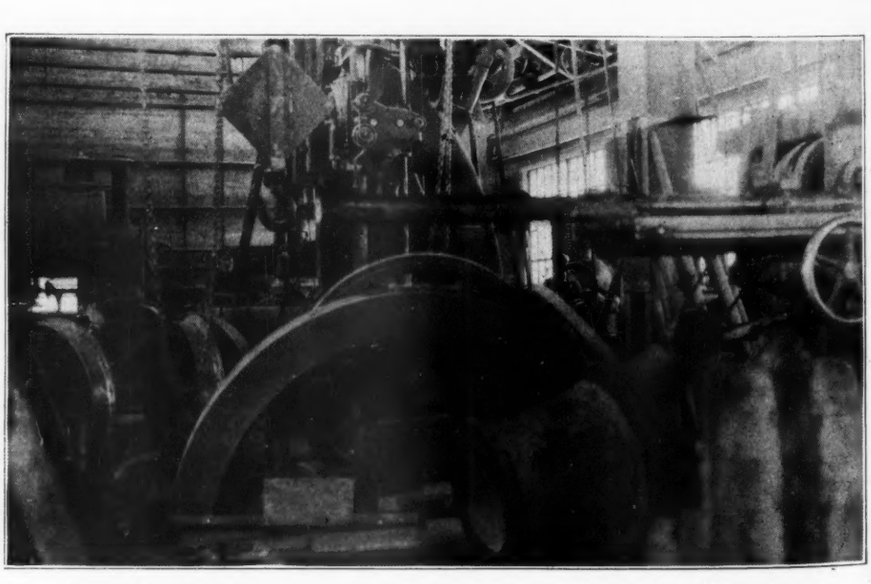
This plant employs the dry process. Pulverized coal from eastern Kentucky



View in the company's up-to-date machine shop, showing the large power-house requirements of an up-to-date cement plant



Another view of machine shop, showing large number of heavy power-consuming machine tools



View showing character of repair work done—locomotive drivers, etc.

is used (13,300 B. t. u.) The output of each kiln before the waste-heat boilers were installed was about 900 bbls. per day and the coal consumed per barrel of clinker burned was 110 lbs. Prior to the installation of the first waste-heat boiler, it required 91.7 lbs. of coal per barrel of cement for the power-house boilers. With the first installation, this was cut to 40.21 lbs. per barrel of cement; with both boilers in operation the figure is 21 lbs. per barrel of cement. Incidentally the coal burned in the kilns to make a barrel of clinker has been reduced to 94.7 lbs. and the capacity of the kilns has been increased to 1250 lbs. per 24 hours.

Taking the fuel saved per barrel of cement in the operation of the power plant at 70 lbs., and the fuel saved in more efficient operation of the kilns at 15 lbs., and we have a total of 85 lbs., which with an annual capacity of 800,000 bbls., amounts to a saving in coal of 38,000 tons in the operation of this one plant. Supposing the same saving could be made in the annual production of 90,000,000 bbls., and the cement industry could save in its annual coal consumption something like 4,000,000 tons, or probably more than $12,000,000, not considering the extra cost in handling the coal that is wasted.

There is, moreover, an appreciable saving in the recovery of the dust as raw material to be re-used in the kilns, and for treatment in potash recovery processes.

Future of the American Cement Industry

Interview With Stephen B. Mambert, President of the Edison Portland Cement Co., By a Representative of the Merchant Marine Supplement of the "New York Herald"—Eulogy of Thomas A. Edison

THE FUTURE OF THE CEMENT INDUSTRY, particularly with reference to exports of cement from this country, is rather difficult to prophesy. We can get some idea of the possibilities, however, if we review the past situation and note the tendencies of export trade since the war. Of course, a large number of different conditions will have a bearing on the subject.

Before the world war (in 1913) the greatest exporter of cement was Germany. Her exports to the various countries of the world totaled 6,500,000 bbls., and nearly one-third of this amount went to Argentina, Brazil, Chili and other South American countries. Since 1913 Germany's total exports of cement have dropped to nearly one-third of her prewar total, practically all of which has been going to Holland.

The cement exports of Belgium in 1913 nearly equaled those of Germany. About one-half went to Argentina, Brazil and other South American countries. But Belgium's cement industry has become prostrate. When the Germans found it necessary to evacuate Belgium they followed the deliberate policy of so crippling the industries as to make competition impossible for years. It is said that metallurgists, mill operators and trained experts were sent from Germany to direct the looting and complete the destruction, so that the mills would have to be rebuilt from their very foundations.

The United Kingdom formerly exported 3,500,000 bbls., not quite three-fifths of the amount shipped by either Germany or Belgium. The war had the effect of cutting England's cement exports in half.

With the chief competitors of the United States in the cement trade temporarily prostrated industrially, this country occupies such an advantageous position that the exportation of cement becomes one of the opportunities of peace. Latest reports along this line show that not only are the gains in cement exports made by the United States during the war being retained, but they have increased in this first post-war year.

Rapid Growth of Industry

Scarcely any other industry has developed with such phenomenal rapidity in recent years as has that of cement. It is used in hundreds of ways never dreamed of fifty years ago, there being now one thousand definite uses for cement. The growing demand and number of uses have speeded up production until in 1917 the United States' output was nearly 95,000,000 bbls. (of 380 lbs. each, the basis of all calculations here given). This is almost equivalent to one barrel used per inhabitant of the country. Compare this with the production of 2,000,000 bbls. in 1880, and 17,000,000 bbls. in 1900.

Cement competes successfully with brick and stone for durable construction, and with lumber for quick construction. It has replaced wooden sidewalks entirely, and competes with iron and clay for sewer pipe. Unlike common brick, whose chief consumption is in the large cities, cement has won a large market in the farming States for use in silos, barns, bridges, culverts, dams and aqueducts, and has also gained a foothold in shipbuilding. In the United States it shows a five-fold increase in per capita consumption between 1895 and 1916, while lumber and brick consumption has decreased 40 per cent.

Edison's Contribution to the Industry

The improved methods that have been introduced by Thomas A. Edison into the manufacture of cement have gone a long way toward reducing the cost and making it the universal building material.

Starting right at the quarry where the stone is mined, picture the old method of operation which was to drill and blast down small quantities of stone, reducing each stone to a size that could easily be handled by man, and the shoveling, loading and lifting of each piece by men to the cars. The necessity of reducing the stone to such small size at the quarry required great quantities of explosives and materially restricted the production, while maintaining a high cost. Edison first introduced steam shovels which replaced these expensive methods. Single hundred-thousand-ton blasts make possible a great decrease in labor and dynamite costs.

This method of quarrying the rock was followed by Edison's improved method of crushing. Pursuing the principle that there is a greater economy in rotary than in reciprocating machinery, as exemplified in the electric motor and the steam turbine, Edison developed revolving rolls, which reduced rock from ten tons to one-half inch in size, at considerably less cost than reducing the same rock by means of explosives at the quarry.

Again, Edison invented and gave to the industry rotary kilns of double the capacity formerly obtained, saving a ton of coal to every 60 bbls. of cement produced.

The condition in which American shipments of cement reached foreign ports, on account of the breakage of cement barrels, was another problem. In the usual form of packing, the cement is dumped in a barrel and quickly sealed. The handling in loading and unloading on truck, train, lighter and ship, as well as the vibration of the ship's machinery, causes the cement in the barrels to settle, leaving an air space at the top. This

leaves part of the barrel unsupported by its contents, and therefore more easily breakable. The Edison process permits of packing in such a way that no air space is left in the barrels. The method consists in imitating the ship's motion in shaking the barrel so as to concentrate the contents and eliminate the air while being packed—then filling up the barrel; repeating the process until the barrel receives its maximum quantity. The solid contents give no opportunity for air space to form in transit to and from the ship and while on shipboard, and the contents always carry the package rather than the package carrying the contents.

The price of cement has reacted more slowly to the general rise in price of commodities during the six years, and is actually less than the average percentage rise in price of all commodities for the period from 1913. In fact, according to statistics prepared by the War Industries Board, the average advance in the prices of all commodities is one-third greater than the advance in the price of cement.

Export Prospects

The prospect for a rapidly increasing export trade for the United States depends, of course, upon maintaining this low price level, which, in turn, depends upon increased production, aided by large exports at low shipping rates. It seems certain that shipping rates will be lowered rapidly to assist us in meeting foreign competition. This point has been demonstrated by the fact that to date the rates to South American points have been lowered to about one-half of the rates in effect when the armistice was signed. The importance of freight rates to the foreign consumer may be appreciated when it is understood that cement costing about $2.25 in the United States cost $9.60 (American currency) in Rio de Janeiro, in November, 1918, while at the present time the cost is $5.34 in Rio.

South America is becoming one of the greatest consumers of American cement. Since the reduction of European shipments Chili, Brazil and other countries must look to the United States, Japan and possibly Canada, to supply their needs in regard to this commodity. Our shipments of cement to South American ports last year totaled 1,000,000 bbls., in spite of the war curtailment of production and shipping. The increased use of reinforced concrete to supplant stone, brick and adobe in private and public buildings, and the demand for cement for railway and other construction, all mean that the South American market will be a large one.

Argentina is the largest importer of cement in South America. In 1913 that country imported over 4,000,000 bbls., mainly from Belgium, France and England. Of this the United States shipped 60,000 barrels. By 1918 our shipments to Argentina were 200,000 bbls. per annum, an increase of 230 per cent in five years.

Cement is one of the most important articles of importation into Brazil from this country. In 1917 one-half of the imports of this commodity were from the United States. By a special privilege clause cement imported from the United States enjoys a 20 per cent tariff reduction.

While South American imports of cement from the United States have increased to 1,000,000 bbls. per annum, or 200 per cent, since 1913, her imports from England have fallen to 400,000 bbls., or 40 per cent of the former total. Nevertheless, although England is temporarily handicapped, she will continue to be one of this country's chief competitors for the South American market, in view of the fact that South America previously consumed nearly one-half of England's cement exports.

Fuel Cost Determining Factor

In all these countries, as well as in the United States, the production of cement is dependent upon the coal production. Germany may be particularly handicapped by the lessened coal mining, while the cost of English cement may be abnormally high, due to this cause. American cement will be affected somewhat, but it is hoped that it will be to a more moderate degree.

Six million barrels of cement output, plus an efficient merchant marine, place Japan in virtual control of the Far Eastern markets, formerly controlled by Germany. In 1916 Japan exported to China 100,000 bbls., to British India 200,000 bbls., to Australia 80,000 bbls., and to Ceylon 40,000 bbls.

The African market is comparatively small, but growing in importance. Egypt imported 30,000 bbls. in 1913, Algeria 200,000 bbls., and British South Africa 500,000 bbls., France supplying the north and England the south of Africa.

A factor having great weight in determining the volume and flow of foreign shipments is the rate of foreign exchange. While in Asia the more favorable rates of exchange, now more favorable than formerly, may encourage our shipments to the Far East, the reverse condition exists as respects our shipments to Europe. In Europe the high conversion rates may reduce American shipments as effectively as a protective tariff against American goods.

Not only must exchange and shipping rates be stabilized, but the volume of trade must be increased, for the cement industry, similarly to all industries of a tonnage nature, is only able to manufacture its products at a minimum price when the tonnage total is at the maximum. For this reason the increasing use of cement, in raising the standard of living, is dependent upon the securing of as large a tonnage of export business as is possible. Only by securing this large tonnage will the industry as a whole be able to maintain its price scale at less than the general increase in prices taking place in all other commodities.

Whether or not America may give the world the benefit of this lower cost is dependent upon large shipments, the stabilizing of exchange and the establishment of shipping rates which will give American cement an equal chance with foreign cement in foreign markets.

Acme Cement Plant to Start Up Soon

THE ACME CEMENT PLANT at Acme, near Catskill, N. Y., which has been closed down for nearly two years, will be operated at an early date, according to local reports. William Shand, a capitalist, of Lancaster, Pa., who purchased the works early in the year, hopes to have the plant in full operation as soon as some minor changes are made at the quarry.

It is planned to build a standard gauge railroad from the plant to the river to care for the water shipments of cement.

Under previous ownership, only three of the four kilns were operated. Provisions have been made to operate the entire plant so that it will reach its entire capacity, 2,500 bbls. of cement daily.

Mr. Shand contemplates building a large addition to the plant during the winter months so that in early spring the capacity may be doubled.

Cars for Sand and Gravel Men

FOLLOWING UP telegraphic communication with the Car Service Section, and in anticipation that resumption of work at the coal mines we wired Mr. Kendall:

Wires exchanged, desk 26. On resumption work mines Regional Directors anticipate priority order movement gondolas for coal loading. Sand and gravel plants have unfilled orders requiring maximum car supply to prevent carrying this business over into next year. Producing season over December First. Must have consideration. Answer.

We have received this reply:

As coal mines start up, due to large amount of coal on wheels, it may be difficult to supply full requirements to sand and gravel plants. Suggest you transmit specific complaint from shippers where real emergency exists and we will handle with view to giving relief.

BEN STONE,
Business Manager of the Illinois and Chicago Associations of Sand and Gravel Producers.

Construction work in progress on new crushing plant of the Bethlehem Mines Corporation at Bittinger, Penn.

New Quarry Plant of the Bethlehem Mines Corporation

THE VIEW ABOVE shows the progress made up to the middle of October on the new crushing and screening plant of the Bethlehem Mines Corporation at Bittinger, Pennsylvania. The Bethlehem company purchased this property in 1918 of the John R. Bittinger Co., crushed stone and lime producers.

The lime kilns are being dismantled as the new operator will produce only crushed stone for blast-furnace flux with commercial stone and agricultural limestone as by-products.

The brick building in the center of the view is the transformer station and machine shop. The concrete foundations for the railway-car loading bins are shown on the extreme left. The initial crusher will be at the extreme right, near the water-tank tower.

The quarry will be steam-shovel operated—with a track incline to the crusher. The plant will be electrically operated throughout.

The road in front of the plant is a part of the Lincoln Highway, just west of Hanover, Penn., and its contemplated improvement will furnish an outlet for considerable stone.

The Bethlehem Mines Corporation is a subsidiary of the Bethlehem Steel Co. M. L. Jacobs is general superintendent of quarries, and W. S. Bourlier is chief engineer.

Well-Known Gypsum Man in New Role

THE VIEWS BELOW show Harry K. Hobart, well-known in the gypsum industry through his former connection with the U. S. Gypsum Company and other manufacturers, as Treasurer of the Southern Building Supply Co., Washington, D. C. The upper left-hand view also shows Herbert R. Eastwood, president of the company. The other pictures show one of the neatest building-supply yards south of Mason and Dixon's line, and the company's office.

The lower right-hand corner picture shows two air-tight tanks for the storage of lump lime—an Eastern development, credited to the Knickerbocker Lime Co. of Philadelphia.

Proprietors of the Southern Building Supply Co., and their new plant in Washington, D. C.

NEW MACHINERY AND EQUIPMENT

New Portable Air Compressor

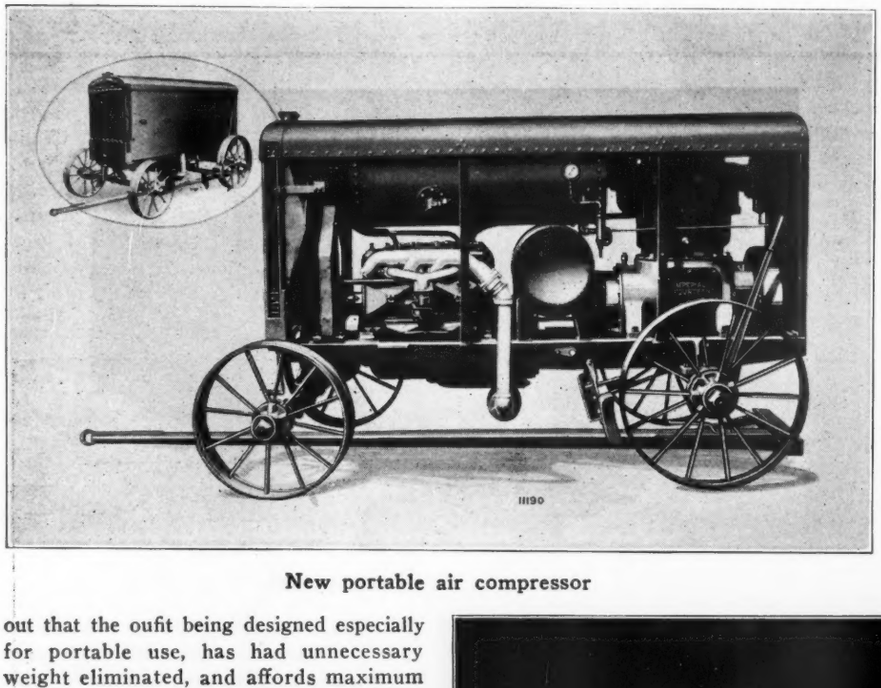
THE INGERSOLL-RAND CO., New York City, has recently introduced a lightweight, gasoline-engine-driven unit, built in two sizes, to be known as the Imperial Type 14 portable compressor.

These are all-steel outfits, from their sheet steel canopy ot the broad-tired steel wheels. The power plant of each consists of a duplex, vertical compressor, driven at high speed by a 4-cylinder, 4-cycle, tractor type gasoline motor. It is pointed out that the oufit being designed especially for portable use, has had unnecessary weight eliminated, and affords maximum air power output per unit weight. The larger machines, of 210 cu. ft. capacity, weigh only 6000 lbs., and the 118 cu. ft. unit 4000 lbs. A point is also made of the fact that gasoline motor drive provides power in economical form and in a mechanism that can be confidently entrusted to the average operator, for men familiar with gasoline engines are everywhere available and make thoroughly competent engineers.

The compressors are provided with inlet unloading devices which automatically close the compressor intake when the receiver pressure rises above a predetermined limit, and permit the machine to again take up its load when the pressure has fallen a definite amount.

Each of these units is equipped complete with receiver, safety valve, drain valves, pressure gauge and service valves, to which the air hose lines may be attached. When fuel tank has been filled, lubricating oil provided and the cooling system supplied with water, the units are ready for work.

The mounting of the machines is worthy of note, particularly the swiveled front axle, which moves freely in both horizontal and vertical planes. This, with the rigidly attached rear axle, gives three-point suspension, and permits the outfit to pass over inequalities of the ground without any racking effect or misalignment of the power plant.



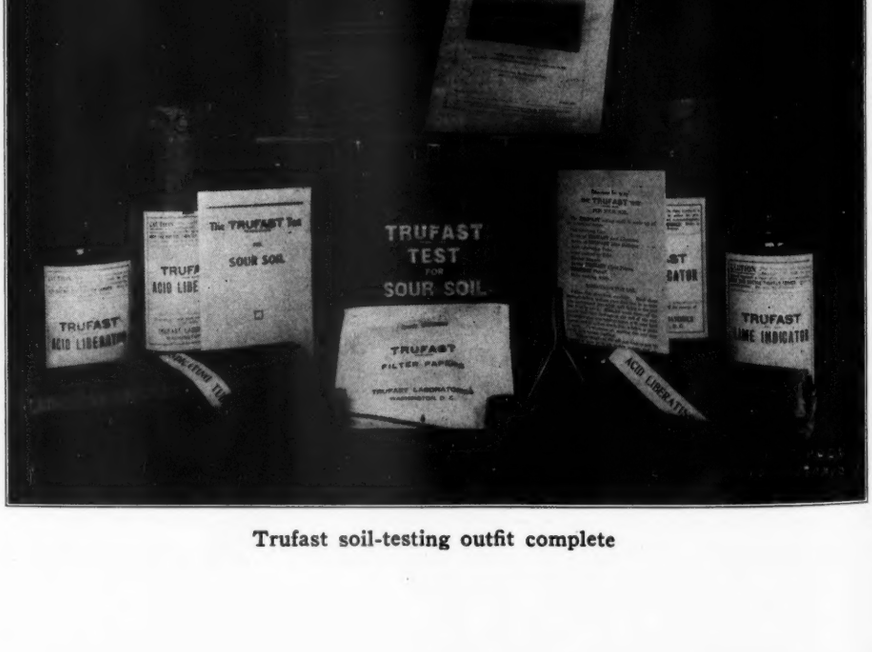
New portable air compressor

Trufast Test for Sour Soil

BASED UPON SOUND chemical principles, the Trufast test outfit is designed for field use and reaches its result by first liberating the acid in the soil, and then neutralizing it. The graduated tubes perform for the farmer all the laboratory calculations necessary in the usual tests, and deliver a result quite as accurate as that obtained by the best of them. The soil tested is accurately and automatically measured in the tube by the amount of liquid it displaces.

The solution used for liberating the soil acids is strictly neutral calcium nitrate. The amount of soil used in the test is 1/100,000,000 of an acre 6 in. deep, and is determined volumetrically by its displacement of the solution. The soil is thoroughly washed and suspended by shaking it in the solution. The turbid liquid is filtered into the lime indicating tube and is titrated with a sodium carbonate solution containing an acid indicator. The amount of lime per acre necessary to neutralize the soil is read from a scale on the tube so graduated that the carbonate content of the lime indicator bears the same relation to a ton of lime as the soil sample does to a 6-in. acre.

The outfit is manufactured by the Trufast Laboratories, Washington, D. C., and sells for $9.50.



Trufast soil-testing outfit complete

General News From the Rock Products Markets

Indications of Continued Activity in General Building

OCTOBER STATISTICS for construction operations bear out the evidence that the activity in building which has advanced from practically nil a year ago is still on the increase. While it is not in line with facts to say a "boom" is on, it is worthy to note that during recent months in practically every city there are many projects in the process of construction.

Returns from the building departments of 175 cities of the United States to "The American Contractor" show October to be a very favorable month as evidenced by the fact that building permits issued show a substantial upward trend from the slight slump in September and a gain of 447 per cent over the October operations of last year.

While only ten cities out of 175 show a loss in comparing 1919 and 1918 activity, a more decisive fluctuation of 80 cities showing gains and 58 showing losses results from comparing October to September activity. Important cities showing heavy gains are: Berkeley, Cal.; Boston; Chicago; Dayton, Ohio; Los Angeles; Minneapolis; New Haven; Saginaw; Washington, D. C., and the boros, Bronx, Brooklyn, Queens, and Manhattan.

The following cities show marked losses from September activity: Baltimore; Bayonne, N. J.; Detroit; Erie, Pa.; Lowell, Mass., and Springfield, Ill.

The following table shows activity by months for the years 1919 and 1918:

	No. cities	1919 value	1918 value	Per cent gain
January	152	$ 23,869,215	$27,291,218	*12
February	153	32,058,628	21,680,314	48
March	169	64,884,325	36,529,620	77
April	165	84,914,008	44,516,828	91
May	168	112,678,640	51,764,746	110
June	158	134,726,715	47,793,182	182
July	162	140,474,662	43,424,768	228
August	153	160,947,233	43,819,383	267
September	160	137,023,736	35,976,845	281
October	175	155,516,860	28,417,115	447

*Loss.

August is the only month in which the total number of permits exceeds the October total, but, of course, comparisons to be of value must take into consideration the number of cities reporting. The following table shows the valuation of permits per city and affords a practical means of comparing activity during the months and for the years indicated. Average value per city:

Year	July	August	September	October
1919	$900,000	$1,000,000	$860,000	$890,000
1918	290,000	287,000	225,000	162,000
1917	494,000	416,000	435,000	498,000
1916	969,000	624,000	627,000	776,000
1915	615,000	615,000	594,000	807,000
1914	951,000	733,000	593,000	567,000

In only two years, namely, 1918 and 1914, does October show a decrease from September. The trend of activity normally jumps upward during this month. In this respect 1919 shows normality.

The average value of the October permit is $3,880, practically the same as the September value.

Province of the Trade Paper

THE TRADE PAPER is not a judge to decide the nice points of controversy upon any question of method or system, but it is the compendium for all the evidence from every available source and its aim is to spread this evidence before the trade for the separate decision and action of each member. Each reader can thus act upon the information in the light of his own experience and local conditions—in short, by independent selection; for each one knows what is best for himself—Rock Products, February, 1905.

West Coast Car Shortage—Cost Increases Are Less Than Eastern

THERE is at the present time on the West Coast an almost unprecedented car shortage due to the heavy movement of grain, the unusually large grape crop, and the stevedore strikes, the demand for cars to carry lumber for shipbuilding industries, and the general heavy movement of all kinds of commodities from the West to the East and from the East to the West. In other words, the shortage of cars—or, rather, the unusually heavy demand for cars—is due principally to strikes and big business.

The building material business is particularly handicapped by the car shortage, and neither the railroads nor any one else seems to know how long the present car shortage is likely to continue. The situation is indeed serious and deserving of careful consideration.

There is a retarded building development on the West Coast, which, when under way, will tax the capacity of all quarries and plants to the utmost. A recent study of 25 cities in California indicates that labor costs have increased during the last two years an average of 55 per cent and material prices 75 per cent.

A meeting of good roads leaders in California and Nevada was held in Reno, Nev., November 15, for the purpose of devising ways and means to build a paved highway across Nevada.

Plymouth Company to Construct Another Gypsum Mill

L. E. ARMSTRONG, president of the Plymouth Gypsum Co. and the Plymouth Clay Products Co., will build another gypsum mill which will be ready for operation by next May. The name of the company will be the Iowana Gypsum Products Co., to be incorporated under the laws of Iowa, capital stock to be $250,000. The plant will be located on the M. & St. L. Railroad on the property recently purchased by Mr. Armstrong, known as the Corn Belt Packing Co.'s property. This building was erected a few years ago and is of fireproof construction. This building will be remodeled and enlarged to accommodate a modern and up-to-date plaster mill. All orders for machinery and equipment for the plant will be placed at once, to insure an early completion of the plant for next season's production.

The raw gypsum for this plant will be supplied from the Plymouth mine by a short tramway, which is now constructed to this property. The output of the new mill will be sold and handled by the Plymouth Gypsum Co.'s sales organization. The plant will be a four kettle mill and the output will be 750 tons in 24 hours' operation. This will make the output of the two mills 1,500 tons per day, which will be a 25 per cent larger output than that of its nearest competitor in the Fort Dodge field, Mr. Armstrong says. It will give the Plymouth company eight kettles at the two plants.

The Plymouth Gypsum Co. also contemplates big improvements at its present mill the coming winter. It will be enlarged, and a program is now being laid out for the fireproofing of its present mill by a three year program, building one-third of it each year.

The Plymouth gypsum wall-board and plaster-board plant is now finished, and in a short time they will have their new gypsum block plant in operation. The mortar color plant also will be enlarged this coming winter.

Profit in Worked-Out City Quarries

THE CHICAGO CITY COUNCIL is negotiating for eight and a half acres of worked-out limestone quarry property, the price asked for which is said to be $375,000 or $44,000 per acre. This is the abandoned quarry at Artesian and Grand Avenue, owned by the Artesian Stone and Lime Co. (a subsidiary of the Producers Material Co.), which the city proposes to use as a refuse dump.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton. F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Burlington, Vt.	1.00	.....	2.75	1.75	1.75	.....
Chaumont, N. Y.	.....	1.75	1.65	1.35	1.25	1.25
Coldwater, N. Y.			Flux, 1.50@2.10			
Limekiln, Md.	.75	1.85	1.65	1.50	1.25	1.10
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00‖
Pittsburgh, Pa.	1.25	1.40	1.50	1.50	1.50	1.50
Walford, Pa.	1.25	1.40	1.50	1.50	1.50	1.50
CENTRAL:						
Alton, Ill.	1.80	.....	1.40	1.35	.....	.....
Anna, Ill.			1.00@1.25 for prepared sizes			
Bettendorf, Ia.			1.50 per cu. yd., all sizes			
Brillion and Sherwood, Wis.	.90@1.00	.....	1.00	1.00	.....	1.00
Buffalo, Ia.	.90	1.30	1.20	1.10	1.10	.....
Chicago, Ill.	1.00@1.20	1.20@1.50	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*	.....	.....
Dundas, Ont.	.65	1.20	1.20	1.20	1.00	1.00
Eden and Knowles, Wis.	1.00	1.00	1.00	1.00	1.00	.....
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Greencastle, Ind.	1.25	1.10	1.00	.90	.90	.90
Hull, Canada	2.50	2.75	2.75	2.25	2.00	1.75
Illinois, Southern	2.00	1.35	1.35	1.35	1.25	.....
Kokomo, Ind.			.90@1.00 all sizes			
Mayville, Wis.	.75@ .85	1.00	1.00	1.00	1.00	1.00
Moline, Ill.			1.50—2300 lbs. all sizes			
Montrose, Ia.	1.25	1.15@1.25	1.15@1.25	1.10@1.25	1.10@1.15	.....
Oshkosh, Wis.			1.25 per ton, all sizes			
Ottawa, Ont.	2.50	2.75	.....	2.25	2.00	.....
River Rouge, Mich.	.95	1.15	1.15	1.15	1.15	1.15
Sheboygan, Wis.			1.00 to 1.25 all sizes			
Stolle, Ill.	.....	1.30	1.30	1.30	.....	.....
Stone City, Ia.	.50	.....	1.40	1.30	1.20	.....
Toronto, Canada	1.55	2.10	2.10	2.10	1.90	1.90
SOUTHERN:			These prices include 90c freight			
Brooksville, Fla.	1.00	.....	.....	2.60	.....	.....
Cartersville, Ga.	.....	1.95	.....	1.85	1.75	.....
Fort Springs, W. Va.	1.00	1.15	1.60	1.50	1.45	.....
Irvington, Ky.	.....	.....	1.00	1.00	1.00	1.00
Mascot, Tenn.	.....	1.00@1.25	.....	1.50	1.50	.....
Winnfield, La.	.80	1.80	1.80	1.80	1.80	1.80
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.70	1.70
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
El Paso, Tex.			1.00 for all sizes			
Kansas City, Mo.	1.00	1.60	.....	.....	.....	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	.....	.90	2.75	2.50	2.00	1.75
Bernardsville, N. J.	.....	2.80	2.60	2.40	2.20	.....
Bound Brook, N. J.	1.00@1.10	2.00	1.80	1.70	1.50	.....
Branford, Conn.	.80	1.50	1.50	1.20	1.10	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Castro Pt., Richmond, Cal.	.50*	.....	1.50*	1.50*	1.40*	.....
Dresser Junction, Wis.	.50	1.75	1.75	1.55	1.50	1.50
Farmington, Conn.	.....	1.05	1.05	1.05	.95	.....
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Little Rock, Ark.	1.75	2.50	.....	2.00	1.50	1.35
Millington, N. J.	1.80	1.80	1.80	1.60	1.00	.....
New Britain, Conn.	.80	1.30	1.25	1.20	1.00	.....
Oakland, Calif.	.....	1.75*	1.75*	1.75*	1.75*	.....
Rock Hill, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Westfield, Mass.	.60	1.20	1.10	1.00	.90	.80
Winchester, Mass.	.75	.75	1.60	1.45	1.25	1.25‖

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20	1.20‖
Middlebrook, Mo.—Granite	3.50	.....	1.75	1.75	.....	1.00‡
Portland, Maine—Granite	1.50	.....	.....	1.35	1.25	.....
Roseburg, Ore.	.....	1.50	1.25	1.05	1.00	1.00
Redington, Pa.—Dolomite	1.00	1.10	1.10	1.10	1.10	1.10‖
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
Strathmore, Va.—Granite	.....	.50	1.75	1.75	1.75	1.50
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20‖
Granite	1.25	.....	1.50	1.50	1.50	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone Wholesale at Plant, per Ton

EASTERN:

Coldwater, near Rochester, N. Y.—Analysis: $CaCo_3$, 56.77%; $MgCo_3$, 41.74%—80% thru 100 mesh; ppr., 4.50; bulk 3.00

Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); ppr., 4.00; bulk 2.50

Paper bags 4.00

Cobleskill, N. Y.—Ppr., 5.00; bulk 3.00

Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk 3.25

Grove, Md.—90% thru 4 mesh; bulk 3.00

Hillsville, Pa.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 1½%—(70% thru 100 mesh) in 80 lb. ppr. bags, 4.25; bulk 2.75

Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk 2.25

Lime Kiln, Md.—50% thru 50 mesh; bulk 4.00

Pownal, Vt.—(50% thru 100) Analysis, $CaCo_3$, 90%; $MgCo_3$, 5%; ppr., $4.50; bulk 2.75

Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk 2.75

West Stockbridge, Mass. — Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk 2.85

Williamsport, Pa. — Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); bulk 3.00

Bags 4.50

CENTRAL:

Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—90% thru 100 mesh.. 3.00

50% thru 50 mesh 2.00

Anna, Ill.—Ground; bulk 1.25

Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, 98.5%; $MgCo_3$, 0.5% 1.75

Canton, O.—50% thru 100 mesh; bulk 3.00

Bags 4.50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh 1.00

Columbia, Ill., near East St. Louis —(⅛" down) ..... 1.25@1.80

Ellettsville, Ind.—Analysis, Carbonate, 98% 2.00

Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh 1.25

Greencastle, Ind.—(Analysis, $CaCo_3$, 98%) 50% thru 50 mesh 1.75

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 ..... 2.75@3.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ 2.00

Marble Cliff, O.—(50% thru 100 mesh) Analysis, $CaCo_3$, 86%; $MgCo_3$, 8%.. 2.50

Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 4.50; bulk 2.50

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼" sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100 ..... .90@1.00

Milltown, Ind.—Analysis, $CaCo_3$, 94%; $MgCo_3$, 3% 1.50

Montrose, Ia.—(90% thru 100 mesh).. 1.25

Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.8%—30% thru 100 mesh; 100% thru 20 mesh 4.00

Muskegon, Mich.—(90% thru 50 mesh) Analysis, $CaCo_3$, 53.35%; $MgCo_3$, 43.27% 2.50

Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—70% thru 100 mesh, bulk ..... 2.50@4.00

Rockford, Ill. — Analysis, $CaCo_3$, 53.75%; $MgCo_3$, 44.35% 1.25

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ⅛" mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82% 2.00

(Continued on next page.)

Agricultural Limestone Wholesale at Plant, per Ton

(Continued from preceding page.)

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12% 1.50
Stone City, Ia.—Analysis, $CaCo_3$, 98% (90% thru 50 mesh) ..... .50
Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh; 30% thru 50; 80% thru 100; 100% thru 5/32 screen) 1.80
Whitehill, Ill. — Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—
90% thru 50 mesh, bulk 2.00
90% thru 100 mesh 5.00

SOUTHERN:

Brooksville, Fla.—50% thru 50 mesh 2.80
Cartersville, Ga.—Analysis: 96 to 98% combined carbonates—All thru 10 mesh with all dust in 2.50
Dittlinger, Tex. — Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%.
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00
Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 3.25
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00
Irvington, Ky.—(90% thru 50 mesh) 2.00
Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%) average price 2.00
Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 2.50
(All thru 10 mesh) 2.00
80% thru 200 mesh 3.50
Paper bags $1.50 extra per ton; burlap, 2.00 extra per ton.
Maxwell, Va. 2.50
Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50
Tyrone, Ky.—Analysis, $CaCo_3$, 93%; $MgCo_3$, 6%—90% thru 4 mesh 2.25
Winnfield, La.—(50% thru 50 mesh) 3.00

WESTERN:

Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½%; bulk 2.50
Fresno, Calif.—(Analysis, $CaCo_3$, 94%; $MgCo_3$, .02%) 50% thru 200 mesh; 90% thru 100; 100% thru 40. Prices for delivery: Sacks, 6.50; bulk Sacks, 10c each. 6.00
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 1.35

Miscellaneous Sands per Ton at Plant

Silica sand is quoted washed, dried and screened, unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. ..... 2.00@2.10
Special hand selected rock 2.50
Cedarville and South Vineland, N. J.—
Glass, damp 2.00
Glass, dry 2.50
Gray Summit, Mo. ..... 2.00@2.50
Guion, Ark.—Contracts 1.50
Carlots 2.50
Hancock, Md.—Engine and glass ..... 2.50@3.00
Klondike and Pacific, Mo.:
Contracts 2.00
Car lots 2.50
Mapleton, Pa. 2.50
Glass, damp 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .30@ .40
Millington, Ill. ..... 1.75@2.25
Mineral Ridge, O. 2.75
Montoursville, Pa.—Green, washed ..... 2.50@2.75
Oregon, Ill. ..... 1.75@2.00
Ottawa, Ill—Without contracts 2.00
Large contracts 1.75
Robinson, Md., washed, screened, not dried 2.00
St. Marys, Pa.—Green 2.50
Sands, Elk Co., Pa.—Selected, green 2.50
Thayer, W. Va.—Washed 2.50
Unwashed 2.00

FOUNDRY SAND:

Albany, N. Y.—Core ..... 1.25@2.00
Molding fine, furnace lining 2.00
Molding coarse 1.80
Brass molding 2.00
Sand blast ..... 1.50@3.50
Allentown, Pa.—Core ..... 1.40@1.50
Arenzville, Ill.—Molding fine 1.50
Bowmanstown, Pa.—Core 1.25
Molding fine or coarse 1.50
Traction 1.25
Cedarville and So. Vineland, N. J.—
Core, damp 2.00
Core, dry 2.50
Cleveland, O.—Core ..... 1.00@1.50
Molding fine, molding coarse ..... 1.75@2.25
Brass molding ..... 1.50@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.	.....	1.00	.....	1.00	.80	.80
Attica, N. Y.	.65	.65	.65	.75	.75	.75
Boston, Mass.	1.65	1.10	2.25	1.75	1.75	1.60
Concord Jct., Mass.	1.00	1.00	1.25	1.25	1.25	1.25
Farmingdale, N. J.	.....	.43	1.25	1.15	1.05	.....
Fishers Station, N. Y.			.65@ .75, all sizes			
Hartford, Conn.	.90	.....	1.25	1.15	1.15	1.15
Morristown, N. J.	.60	.60	1.20	1.00	1.00	.....
Washington, D. C.—Wharves	.75	.75	2.00	1.40	1.20	1.20
West Peabody, Mass.	.35@ .45	.35@ .45	2.00	1.20	1.20	1.20
Yardsville, N. J.			.50@ .75, all sizes			
CENTRAL:						
Alton, Ill.	.60@ .75	.60@ .75	1.50@4.50	1.30	1.20	1.20
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.75	.75	.75	.75	.75	.75
Barton, Wis.	.75	.70	1.00	.70	.70	.70
Beloit, Wis.			.50 sand, .70 gravel			
Chicago	.....	1.25@1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Columbus, O.	.....	1.00	1.00	1.00	1.00	1.00
Covington, Ind.	.75	.75	.85	.75	.75	.75
Des Moines, Ia.	.60@1.00	.60	1.50	1.50	1.40	1.40
Earlestead (near Flint), Mich.	.60	.65	.....	1.20	1.00	.85
Escanaba, Mich.	.....	.90	1.60	1.20	1.00	.90
Grand Rapids, Mich.	.70*	.70*	1.35*	1.15*	1.00*	1.00*
Hersey, Mich.	.50	.....	.....	1.00	1.00	.....
Indianapolis, Ind.	.60	.60	.....	1.50	.75	.75
Janesville, Wis.	.....	.60	.....	.....	.60@ .70	.....
Mason City, Ia.	.70	.60	1.60	1.50	1.50	1.40
Milwaukee, Wis.	.70	.70	.80	.80	.80	.80
Minneapolis, Minn.	.50	.50	1.75	1.75	1.50	1.50
Moline, Ill.	.60	.60	1.10	1.00	1.00	1.00
Oxford, Mich.	.....	.....	.....	.....	.85	.....
Rockford, Ill.	.60	.....	.75	.75	.75	.75
Saginaw, Mich.	1.00	1.10	2.10	1.95	1.95	1.85
			(Includes freight rates .60 to .80 per ton)			
St. Louis, Mo., F. O. B. cars	1.20	1.25	1.50	1.30	.....	1.25
Summit Grove, Ind.	.75	.....	.....	.....	.....	.....
Terre Haute, Ind.	.75	.75	.....	.....	.....	.....
Toledo, Ohio			.60, all sizes			
Winona, Minn.	.....	.70	1.60	1.10	1.10	1.10
Yorkville, Moronts, Oregon and Ottawa, Ill.	.75	.75	.75	.75	.75	.75
SOUTHERN:						
Knoxville, Tenn.	.85	.85	.85	1.50	1.50	1.25
Lake Weir, Fla.	.....	.50	.....	.....	.....	.....
Macon, Ga.	.....	.75@1.00	.....	.....	.....	.....
New Martinsville, W. Va.	1.30	1.00@1.10	.....	1.20	.....	.70@ .80
Roseland, La., and Condron, Miss.	.....	.50	.....	1.00	.....	.....
Thomas, La.	.60	.....	.....	.....	.....	1.75
Valde Rouge, La.	.....	.80	.....	.....	.....	1.25@1.50
Waco, Texas.	.....	.70	.....	.....	1.10	1.10
WESTERN:						
Kansas City, Mo.	.60	.60	(Kaw river sand .60 per ton carlots)			
Lincoln, Neb. (on cars)	1.00	1.00	2.10	2.10	.....	1.90
Pine Bluff, Ark.	1.00	.90	.....	.....	1.30	.....
Pueblo, Col.	.80*	.60*	.....	1.50*	.....	.....
Roseburg, Ore.	1.50	1.00	1.00	1.00	1.00	1.00
San Francisco, Cal.	1.25	1.25	1.50	1.15	1.15	1.15
Saratoga, San Jose, Calif.	.....	.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25*	1.25*	2.00*	1.25*	1.25*	1.25*
Vancouver, Wash.	.....	1.10*	.....	1.30*	.....	1.10*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60	.50@ .65	.....	.....	.....	.65
Burnside, Conn.	.80*	.....	.....	.....	.....	.....
Lowell Junction, Mass.	.75*	.65*@.75*	.60*	.....	.....	.....
Yardville, N. J.	.....	.50@ .75	.....	.....	.....	.....
York, Pa.	.....	.80@1.10	(crushed rock sand)			
CENTRAL:						
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.60	.60	.60	.60	.60	.60
Escanaba, Mich.			1.00 cu. yd., all sizes			
Grand Rapids, Mich.	.60	.....	.....	.75	.....	.60
Hersey, Mich.	.40	.....	.....	.50	.50	.50
Illinois, Northern	.....	.....	.....	.....	.....	.50@ .60
Janesville, Wis.	.....	.....	.....	.....	.55	.....
Oxford, Mich.	.....	.....	.....	.....	.85	.....
Rockford, Ill.			Sand and Gravel mixed, .55@.65			
Saginaw, Mich. (Incldg. frt.)	1.40	1.40	1.40	1.40	1.40	1.40
Wabash Valley District, Ind.			.60 for all sizes			
Winona, Minn.			Pit run gravel under 2-in., .70			
Yorkville, Moronts, Oregon and Ottawa, Ill.	.60	.....	.....	.....	.....	.....
SOUTHERN:						
Albany, Ga.	.70@1.00	.....	.....	.....	.....	.....
Dudley, Ky. (Crushed Sand)	.95	.90	.....	1.00	.....	.....
Knoxville, Tenn.	.85	.85	.85	1.50	1.50	1.25
Lindsay, Tex.			Ballast pit-run gravel, .50 ton			
Pine Bluff, Ark. (Road Gravel)	.....	.....	.....	.....	.45	.....
Thomas, La.	.....	.....	.....	.....	.....	.40@ .70
Valde Rouge, La.	.....	.....	.....	.....	.....	.60@ .75
Waco, Texas	.....	.....	.....	.....	.....	.67
WESTERN:						
Pueblo, Col.	.....	.60*	River Run, .60 unscreened			
Roseburg, Ore. (crushed stone)	2.00	.....	.....	1.25	1.25	1.00
Saratoga, San Jose, Calif.	.....	.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ore.	.....	.40	.....	.....	.40	.....

* Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag Wholesale at Plant Per Ton

City or shipping point	Roofing	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Buffalo, N. Y.	1.75@2.00	.85	.85	.85	.85	.85	.85
Cleveland, Ohio.		.85		1.05	1.05	.95	.95
E. Canaan, Conn.	4.00	1.00	1.50	1.25	1.10	1.10	1.10
Erie, Pa.	1.75	.85@1.00	1.00@1.50		1.00	1.00	1.00
Emporium, Pa.		1.00	1.00		1.00	1.00	1.00
Ensley, Ala.	2.05	.90		.90@1.20	1.00	.90	.85
Hokendaugua and Topton, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Lebanon (Donaghmore), Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia Dist.	2.50	.75	1.50	.85	.85	.85	.85
Pittsburgh, Pa., Dist.	2.05	1.10	1.50	1.10	1.10	1.10	1.10
Sharpsville, Pa.	1.75	1.00	1.25	1.00	1.00	1.00	1.00
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton and Jackson, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	All sizes, 2.00, F. O. B. Toledo						
Youngstown, Sharpsville, Hubbard, Leetonia, O.	2.00	1.10	1.50	1.10	1.10	1.10	1.10

Agricultural Lime and Hydrate at Plant Per Ton

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		7.50@8.00	65		
Berkeley, R. I.		16.00	45	15	
Bellefonte, Pa.	**7.25**		**95.5**	**.72 to .89**	
Bridgeport, Pa.	7.50		55	44	10.50
Cavendish, Vt.	2.50 bbl. in car lots				
Cavetown, Md.	**8.50**				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	**10.75**
Chippewa, Lycoming Co., Pa.	5.00@5.50		78.67	1.33	
Espy, Pa.	**4.50**		82	1.25	
Farnams, Mass.	5.00	7.50			
Frederick, Md.	7.75		88	5 to 8	10.50
Grove City, Pa.	7.00 lmp.	9.00 grd.	75.48	0.80	10.00
Grove, Md.	8.00				**10.75**
Highgate Springs, Vt.		8.00	85	2	
Hollidaysburg, Pa.	6.50		94.25	.30	
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Bluff, Pa.	**5.00@6.25**		**78.67**	**1.33**	
Lime Kiln, Md.	8.00	10.75			10.75
Lime Ridge, Pa.	5.00@6.25		80.56 to 62.56	3.87 to 1.75	
Mt. Union, Pa.	4.25		94.6		
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Ottawa, Ont.	**12.00**		**95**	**1.5**	
Paxtang, Pa.	5.00		60	12	
Rosedale, N. Y.	8.00		96	5	(Bulk, 6.00)
Sandville, O.					9.00
Steuben, Pa., Dover Plains, N. Y., York, Pa.		7.00@9.50	70		10.75 to 12.00
Union Bridge, Md.	8.50		73	1	10.75
West Rutland, Vt.	**5.00**	**7.50**	**68**	**3**	**10.00**
Williamsport, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
Williams Station, Pa.	7.50		60.6	39.1	9.75@10.50
York, Pa.	8.00		90 to 95	2 to 7	10.75
Zylontte Station, Adams, Mass.		**8.00**			
CENTRAL:					
Alton, Ill.	10.90		94.0		
Delaware, O.			50	9	9,75
Forest, O.	**7.50**				
Manistique, Mich.		10.00	54 & 95	40 & 1.75	10.00
Marblehead, Ohio			54	16.0	9.75
Mitchell, Ind.	**9.00**				**11.00**
Springfield, Ohio			33.62	17.73	9 75
Woodville, Ohio		9.25	46 to 48	30 to 34	9.25
SOUTHERN:					
Blowers, Fla.	5.00	7.25	98.0		
Burns, Tenn.	8.00		96	0.54	11,50
Chippewa, Fla.	5.00		80.0	15.0	
Erin, Tenn.	8.00		97		
Karo, Va.	8.00		97.0	1.26	
Lineton, Va.	8.50		97	1.74	
Louis Brook, Va.	8.00	10.25	90	1	
Lushing, Va.	9.00	11.25	60	15	12,75
Maxwell, Va.	5.00		84	1.75	
Newala, Ala.	**8.50@9.00**		**99.33**		
Ocala, Fla.	**4.00**	6.00 pulv.	98½ (dry basis)		
Staunton, Va.	6.50	9.00	93	5.5	
WESTERN:					
Bellins, Wash.					**12.00**
Colton, Calif.	4.50		95 to 97	1.5 to 3.0	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Kirtland, N. M.	10.00				
Knowles, Wis.	8.00	9.50	55	45	9.50
Lime, Ore.	15.00		91.48	0.58	
Oscas Island, Wash.		5.50			16.50
San Francisco, Calif.					15.00
Tehachapi, Cal.	**6.00**	**8.00**	**96**	**2**	

Miscellaneous Sands per Ton

(Continued from preceding page)

Delaware, N. J.—Molding	1.50@2.00
Dundee, Ohio—Molding, steel	**1.75**
Eau Claire, Wis.—Core	2.25
Roofing sand	3.00
Brass molding and sand blast	2.25
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction and brass molding	2.00
Molding fine, steel molding	2.00
Molding, coarse	1.50@1.75
Sand blast	3.50
Core	2.00
Klondike and Gray Summit, Mo.—Molding fine	1.50@2.50
Greenville, Ill.—Molding coarse red	1.60
Guion, Ark.—Filter	2.50
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85
Leesburg, Pa.—Core, furnace lining, molding fine and coarse	2.00
Mapleton, Pa.—Molding, fine and core, damp	2.00@2.50
Molding, fine, dry	3.00
Massillon, O.—Steel molding coarse	**2.50**
Molding fine	3.00
Molding coarse	2.50
Traction	2.50
Furnace lining	**3.00**
Core	**2.50**
Michigan City, Ind.—Core, bank	.30@ .40
Millington, Ill.—Furnace lining, roofing, stone sawing	1.50@2.00
Core	1.50
Mineral Ridge, O.—Core, molding, sand blast, roofing, brass molding, etc., washed, screened (damp)	2.10
Montoursville, Pa.—Core	1.50@2.00
Molding fine	1.50@2.00
Traction	1.25@1.75
Brass molding	2.00@2.50
Ohio—Various points:	
Iron molding, fine	**1.50@2.25**
Iron molding, coarse	**1.75**
Brass molding, minimum	**2.00**
Oregon, Ill.—Core	2.00@2.50
Furnace lining	2.00@2.50
Sand blast	2.75
Ottawa, Ill.—Sand blast	2.75
Core, furnace, steel molding	2.00
Roofing sand	2.00@3.50
Stone sawing	1.75
Providence, R. I.—Molding fine	2,00
Molding coarse	1,90
Brass molding	2,25
Sand blast	3.00@4.00
Sugar Grove, Ohio—Core (dried and screened)	2.00
Traction	2.00
Thayers, Pa.—Core and traction	1.75@2.00
Furnace lining, molding	1.25
Utica, Pa.—Core	2.00
Molding coarse, steel	2.00
Traction	2.00
Brass molding	2.00
Warwick, O.—Core	2.25
Furnace lining, green	2,00
Molding fine	2,25
Molding, dried and screened	2,25
Green	1.75@2.00
Traction and brass molding	2.25
Wedron, Ill.—Core, (crude silica)	1.75@1.00
Furnace lining, molding fine	1.75@1.00
West Albany, N. Y.—Molding fine	**1.75@2.25**
Molding coarse	1.50
Brass molding	**1.75**
Zanesville, O.—Molding fine	1.50@2.00
Traction	.75
Molding coarse	1.25@1.75
Brass molding	1.50@2.00

Gypsum, per Ton, at Plant

Castalia, O.—Crushed, to cement mills	3.50
Ground, to cement mills	3.50
Land plaster	6.00
Fort Dodge, Ia., bulk	3.50
Garhutt, N. Y.—Land plaster, bags	7.00
Grand Rapids, Mich.—Crushed gypsum	7.00
Ground gypsum rock	9.00
Gypsumville, Man., Can.	3.00
Oakfield, N. Y.	7.00
Sandusky, O.	6.00
Jute sacks, $3.00 extra; paper, $1.00 extra.	

Ground Rock Phosphate at Plant, per Ton

Centerville, Tenn.—B. P. L., 60% to 70%; ton, 2240 lbs. Ground rock phosphate (90% thru 100 mesh)	8.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 70%	7.75@8.00
B. P. L., 78%	8.00
Gordonsburg, Tenn.—B. P. L., 72%; ton, 2240 lbs. Ground 90% thru 100 mesh	7.00@9.00
Lump rock	6.00@7.50
Mt. Pleasant, Tenn.—(B. P. L., 68%)	
12%	6.00
13%	7.00
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 60% to 70%	8.00@9.50
Nichols, Fla.—Pebble, B. P. L., 70%	10.00
Wales, Tenn.—B. P. L., 70%	7.50@8.50
Walls, Tenn.—B. P. L., 70.2%—	
To County Agri. Assns.	7.50
To others	7.75

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Phoslime, Fla. (in burlap bags, 100-200 lbs.)	15.00
Benotis, Fla.	9.00@11.00

General News From the Rock Products Markets

Georgia to Have Two Trap Rock Producers

DEVELOPMENT OF TWO LARGE TRAP ROCK quarries in Georgia bids fair to rush completion of Georgia's twenty million dollars' worth of good roads, recently provided for by county bond issues. One of the quarries on a 250-acre tract in Stephens County, two miles from Toccoa, on the Southern Railway, will be in operation within sixty days. The other will be in operation within thirty days. It is located in Talbot County, near Talbotton and Columbus, 96 miles from Atlanta, on the A. B. & A. and Central of Georgia railroads. Most of the machinery has already been purchased, including jaw crushers with capacities of 200 tons a day, using steam for power.

The Talbotton Trap Rock Corporation, a $500,000 concern, has made application for a charter, with the privilege of increasing capital from time to time to the maximum of $1,000,000, acting through Attorney A. J. Perryman, of Talbotton. The Toccoa Trap Rock Company, with offices at 303 Walton building, Atlanta, is completely organized, with Geo. O. Barrett, of this city, president.

Banker Says Building Material Prices Will Rise

ST. LOUIS, Mo.—The prices of building materials, stone, lime, cement and other quarry products will increase steadily within the next few months, unless immediate action is taken to remedy the labor situation of the industry, according to S. W. Straus, of S. W. Straus & Company, of St. Louis.

"Cost tendencies are toward higher levels," Mr. Straus said. "And there is nothing to indicate that the industry is approaching a point of price stabilization.

"The building and supply industries are prospering to a much greater extent here, due to the very small number of strikes affecting us. The condition of the weather, too, has also been a great stimulus for building.

"Inquiries for capital indicate a heavy demand for factory buildings, apartment houses and hotels, in which types of construction there is an acute shortage. It is the part of wisdom to go ahead on all building work under the present conditions, and those who are holding off with the expectation of making more advantageous contracts are not basing their actions on good business logic.

"The building shortage throughout this country is as acute as it was at the end of the war a year ago. Labor prices and general living expenses have gone higher, so that the cost of building and building supplies must also advance.

"It is to be regretted, from the standpoint of the general public that rents must advance for some time, but it must be borne in mind that we are paying the penalty of our general lack of thrift in which the innocent as well as the guilty must suffer. We have entirely ignored the laws of supply and demand and, during the year which has elapsed since the signing of the armistice, we have failed to make the desired progress in relieving the building shortage.

"Capital for building purposes has been timed in many instances because of erroneous assumptions that prices would go lower instead of higher, while labor disturbances in the building and producing industries have helped keep production at a low ebb. Until the entire nation resolves to settle the economic problems by the only solution possible, namely, increased production through thrift, we may expect building and material problems to grow more acute continually with rents mounting to corresponding heights.

What Is a Fair Royalty for Limestone?

A PENNSYLVANIA QUARRY OPERATOR wants to know what is a fair and reasonable royalty to pay on a limestone deposit situated on a main-line railway. We guessed from 5 to 10 cents per ton. Are we right? All answers will be treated as strictly confidential.—The Editor.

Not Every Railway Losing with Present Rates

IF THE CHICAGO, BURLINGTON & QUINCY R. R. had been operated for its own account instead of under Federal rental, in the nine months ended September 30, last, it would have earned, on the basis of other income and charges as reported for 1918, at an annual rate of $16.36 a share on the $110,839,100 stock. Net operating railway income for the nine months was $19,349,915, or at the annual rate of $26,772,000, on the assumption that the first nine months represent 72 per cent of the traffic year. This compares with Federal rental of $33,360,683. Corporate expenses and taxes in 1918 were $2,585,725, and, exclusive of lap-over items, other income was $884,409 and deductions $6,935,104, leaving $18,135,580 for the stock.

Indiana Gravel Association's Program for 1920

THE EXECUTIVE COMMITTEE of the Indiana Sand and Gravel Producers' Association met November 12 and considered plans for 1920 Association activities. These include much construction work, involving surveys of production and consumption of our materials, specifications, tests, educational advertising, and legislative and transportation problems.

Texas Developing Sources of Road-Making Materials

AUSTIN, Tex.—The Bureau of Economic Geology and Technology at the University of Texas, under the direction of J. A. Udden, Ph. D., tests hundreds of samples of road material annually from all parts of the State. Since the beginning of the present year more than 350 samples have been tested.

Invaluable information is obtained from the numerous tests made in the laboratories of the bureau, and, according to R. A. McNees, testing engineer, the Bureau is a source of ever-increasing aid to road construction. In determining the physical properties of samples sent in from all sections of the State, laboratory tests are made which indicate the hardness, toughness, resistance to wear, cementing values, specific gravity, absorption and compression. In carrying out these tests numerous costly and especially devised machines and materials are necessitated.

The great impetus given in the last two or three years by the granting of State and Federal aid to highway construction has correspondingly increased not only the voluminous amount of testing work, but has also revealed the importance and usefulness to the State of this scientific information given out by this department of the State University. G. A. Parkinson, in speaking of the immense amount of work done in the laboratories, said that tests have been made of materials from practically every county in the State. Owing to the fact that a series of tests is made of a single sample of material, a large corps of testers are constantly employed. The tests are made free of charge, however, and any one interested in road construction or road materials may have them made simply by sending a sufficiently large sample to the laboratory of the bureau. Also a bulletin issued by this department may be secured, which describes the various testing processes and the different materials found in all the counties of the State.

Incorporations

The Lenni Stone Co., Wilmington, Del., has been incorporated for $150,000.

The Howland Quarry Co., Ann St., Rockaway, N. J., has been incorporated for $100,000.

The Leesburg Silica Sand Co., New Castle, Penn., has increased its capital stock from $8,000 to $50,000.

The McPhee Cement Co., Scranton, Penn., has been incorporated for $50,000. The president is R. S. McPhee.

The Miami Sand and Gravel Co., Dayton, Ohio, has been incorporated for $40,000. George H. Gengnagel, Dayton, is the principal stockholder.

The Great Northern Grocery Co., Portland, Me., has been incorporated to engage in a variety of pursuits, among which is quarrying. The capital is $20,000.

The Dundee Silica Co., Columbus, Ohio, has been incorporated for $100,000 by F. A. Downerd, F. C. Abbott, Charles W. Bryson, George Brewer and I. M. Schooler.

The Acme Sand and Gravel Co., Wilmington, Del., has been incorporated for $100,000. M. L. Horty, M. C. Kelly and S. L. Mackey, all of Wilmington, are the incorporators.

The Noblesville Sand and Gravel Co., Noblesville, Ind., has been incorporated by Samuel D. Weldy, Charles Jump and D. B. McCoun, all of Noblesville, with a capital of $20,000.

The Garden City Sand and Lime Co., Russell, Sheboygan County, Wis., has been incorporated with a capital of $100,000 to engage in draining and clearing land and to manufacture and sell lime. The president is H. G. Nichols, Oshkosh, Wis.

The Newbarre Granite Co., South Ryegate, Vt., has been incorporated for $15,000. The incorporators are H. A. Edson, 3822 Fourth Street, N. W., Washington, D. C.; Alex T. Beaton, South Ryegate Vt., and Clair Ward, Moretown, Vt. Certificates of proposed issue of capital stock and paid up capital for the full amount were filed November 4. The stock was issued for the purchase of quarry lands and personal property.

Personals

G. B. Johnson, Salem, Ore., has been appointed superintendent of the West Coast Granite Co. quarry at Granite Falls, Wash. A new power plant is being installed.

Henry Angel, sales manager of the Kelley Island Lime and Transport Co., Cleveland, Ohio, has been laid up in a hospital for three weeks for an operation, but is progressing satisfactorily.

A. J. Earl, formerly traffic manager of the Kelley Island Lime and Transport Co., Cleveland, Ohio, is now manager of the agricultural lime department of the Palmer Lime & Cement Co., New York City.

John P. Peacock has been appointed superintendent of the quarry and crushing plant of the Bethlehem Mines Corporation at Harrisburg, Penn. Mr. G. H. Muth, the former superintendent at Harrisburg, has been transferred to the Lebanon quarries.

Wm. L. Moorehead has resigned as vice-president of the Duquesne Electric & Manufacturing Co., Pittsburgh, Penn., to become associated with Henry T. Parsons, under the name of Parsons-Moorehead Machinery Co., with offices in the Hostetter Building, 237 Fourth Ave., Pittsburgh. The new firm will make a specialty of furnishing quarry machinery.

A. H. Hinkle, Maintenance Engineer of the Ohio State Highway Commission, has been appointed Maintenance Engineer for the Indiana State Highway Commission, to assume duties December 1. The date for the beginning of actual work of state maintenance is fixed by law to be not later than April 1, 1920; however, the Commission, with the approval of the Governor, may set an earlier date.

Quarries

The Gray Cement Block and Stone Co., Essex Bldg., Newark, N. J., has been incorporated for $100,000.

The American Stone Co. has filed articles of dissolution in the office of county recorder at Louisville, Ky.

The American Rubbing Stone Co. has purchased 28 acres of land in Lafayette township, Kentucky, for $3,500.

Southern Indiana quarries were put out of business for a week or more during the last of October on account of unprecedented rainfall.

The El Paso and Southwestern Railway Co. are installing a complete ballast plant. A 16-in. and a 14-in. Traylor gyratory has been purchased and a 48-in. by 14-ft. heavy duty revolving screen.

The Birdsboro Stone Co. are making some improvements in their plant at Birdsboro, Pa. Four 10x72-in. jaw crushers are being installed as secondaries instead of the gyratories now in use.

The West Shore R. R. is reported to be negotiating for the Little Falls, N. Y., quarry property of the New York Trap Rock Corporation. Rumor states that the railroad company intends to erect a new crushing plant to make ballast.

M. J. and W. M. Schmitt have purchased the Verhalen property at Saukville, Wis., where they will erect an up-to-date plant to make from 6,000 to 8,000 concrete tile per day. They have purchased the Juhre gravel pit at Saukville and will produce their own aggregates.

The State of Pennsylvania has leased a quarry and will soon begin operations in the western part of the State. The quarry will be operated by the State Highway Department, which claims that prices asked by commercial crushed stone producers in that section of the State are too high.

The Wisconsin Granite Co. has plans under way for greatly increasing its production of crushed stone at its Sioux Falls, S. D., quarries. It is expected by spring to have installed new equipment and machinery to produce 800 cu. yd. of crushed stone per day. The principal offices of the company are in Chicago. J. J. Sloan is secretary and general manager.

The Charles Warner Co., Wilmington, Del., are making some considerable changes in their plant, which consists in the purchase of a 5x14-ft. eccentric grizzly feeder, a 48x60-in. jaw crusher, a 60-in. x 18-ft. heavy duty revolving screen, and other incidental crusher plant equipment from the Traylor Engineering and Equipment Co.

The Whittier Granite Co., Montpelier, Vt., has sold its quarry in Calais, Vt., to the Hughes Granite Co. of Clyde, Ohio, which will take a deed as soon as the titles have been examined and approved. The new owner plans the construction of a railroad, steam or electrical operated, and the erection of a cutting and sawing plant. This quarry, formerly owned by Patch & Co., has been in operation three years, with only team transportation.

The Wilmington Crushed Limestone Co., Melvin, Ohio, has acquired a large tract of quarry property in this town, Clinton County, Ohio, on the Pennsylvania and Baltimore & Ohio railroads, and has begun the erection of a large crushing plant. H. L. Stinson, of Queen City Gravel Co., Cincinnati, is manager and H. S. Anderson, formerly erecting engineer for the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., will have charge of the construction and operation of the new plant as superintendent. The president ot the company is J. M. Sprague, the treasurer, A. J. Wilson and the secretary, C. W. Fisher, all of Wilmington, Ohio, where the main office of the company is located.

Claude B. Heilman, 525 North Eighth St., Lebanon, Pa., has purchased the machinery, plant and good will of the Bunker Hill Sand & Stone Co., of that city.

The farmers of Salem, Mo., are organizing a co-operative company for quarrying and grinding limestone for agricultural purposes. H. A. Hale of Salem is a prime mover in the new project.

The Amherst, Ohio, quarries of the Amherst Blum and Delbridge companies have been consolidated under one management. These are cut sandstone propositions. W. A. Smith of Cleveland is the head of the new consolidated firm.

Lime

The J. M. Meffert Lime Kiln, near Oakhurst, Fla., was destroyed by fire.

The Empire Lime Kilns, Bellefonte, Pa., have not been operating since September, 1918, pending a dissolution of partnership. The president and general manager, Conrad Miller, has retired from business, and W. J. Miller and M. J. Miller have taken over the company and operations have been resumed under the name of Valley View Lime Kilns.

The Perkins Builders Supply and Fuel Co., Des Moines, Ia., wish to announce their change of business name from Des Moines Fuel and Lime Co. This change was made necessary, due to the confusion because of the great number of firms of the same name. The company also wish to announce the election of Leroy C. Perkins, vice president and general manager.

Cement

A new roofing material is said to be made in England by the use of one part of finely ground asbestos to six parts of portland cement mixed into a paste with water and rolled into sheets.

The Helderberg Cement Co., Howes Cave, N. Y., is shut down for a couple of months for the purpose of installing new machinery, according to local reports. This is said to be the first time the plant has been shut down in seven years.

The Sandusky Cement Co., Cleveland, Ohio, has discovered both limestone and shale under its property at Syracuse, Ind. Borings show a 60-ft. stratum of shale at a depth of about 600 ft., and under this a 40-ft. stratum of limestone. The Syracuse mill formerly operated from clay and marl deposits which are about exhausted. Recently the company contracted for its immediate limestone needs with the Casparis Stone Co., near Logansport. A shaft will be sunk and the shale and limestone mined in the near future.

Manufacturers

The Schaffer Engineering & Equipment Co., Pittsburgh, Penn., has established an office at Chattanooga, Tenn., to cover its southern territory. This office is in the James Building.

Gypsum Products

The Centerville Gypsum Co., Centerville, Iowa, has increased its capital stock from $75,000 to $150,000.

Passed By The Screens

Sand and Gravel

The Automatic Gravel Products Co. has practically completed the erection of its crushed rock and gravel plants on Muscatine Island, Ia., and plans to start operations early next week. The work was started about June 1. The capacity of the rock and gravel plants, whose operations will cover about forty acres, at present will be approximately 1,200 tons of gravel daily, but will be increased later. Ten men are furnished employment by the new company. A railroad spur, about a mile and a half in length, from the main line past the plant to the river has already been completed. The plant is located about half way on the spur, making it possible for the company to ship its products either by rail or water. Future plans of the company include the erection of a dock on the river front for efficient loading of barges to cities up and down the river. The company, which was organized last spring, claims Muscatine Island sand and gravel is the best obtainable for building purposes and that it will be in great demand. Although planning to ship both by rail and water, company officials say that practically all river city shipments will be made on barges loaded on the river front.

Slag

The National Slag Co., Allentown, Pa., have added to their equipment a 36x16-in. set of heavy duty crushing rolls with corrugated shells.

Phosphate

The Alliance Fertilizer Co., Alliance, Ohio, is building a new large acid phosphate plant.

The Seminole Phosphate Co., Croom, Fla., is rebuilding the plant which was destroyed by fire. They are installing a 300-h. p. engine, dryer, grinding mill, new elevators and shafting.

Morris Fertilizer Co., Bartow, Fla., the fertilizer manufacturing branch of the Morris & Co. meat packing interests, will build a big phosphate plant near Bartow, Fla. This enterprise will have a daily capacity of 1,000 tons of washed pebble phosphate rock. A. Bentley & Sons Co., Jacksonville, Fla., are the contractors, and the Scofield Engineering Co., Philadelphia, is the power engineer.

Potash

The Ironton Portland Cement Co. of Ironton, Ohio, has placed its potash leaching plant in active commercial operation. On September 20 the daily output, which has been steadily increasing, reached 7,000 pounds, being about 15 per cent larger than was estimated as the maximum. The salts are said to be of unusually high grade and analysis, and a carload of 60,000 pounds, sold recently, brought a price above the prevailing market quotation. The plant has been turned over to the owners, who will now conduct operations.

The Fort Worth Nitrate Products Co., of Fort Worth, Texas, has purchased some salt lakes near O'Donnell, in the western part of the state, which are said to be very high in potash salts.

German producers are reported to have fallen down in their promise to furnish American buyers with large quantities of potash salts in exchange for textiles and leather goods, and that negotiations have been broken off. The conditions in Germany are such that the producers can not expect to greatly increase their production.

Retail Dealers

Superior Tile Co., Dover, Del.; $250,000. To make, manufacture, buy, sell and deal in and with tile, sand, lime, cement, etc. W. I. N. Lofland, Frank Jackson, Mark W. Cole, Dover, Del., incorporators.

Carpenter Corporation, N. Y.; $100,000. To acquire mining rights and to develop same. E. Leon Carpenter, Lanacoming, Md.; James R. Carpenter, Altoona, Pa., and Edwin L. Carpenter are the incorporators.

Thomas J. Barkholtz has leased a part of the Asay Springs Farm from the City of Bordentown, N. Y., and will manufacture cement building blocks. Work on the erection of the necessary buildings and the installation of machinery will begin at once.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: 2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Plants For Sale

FOR SALE

LIMESTONE PROPERTY consisting of approximately 100 acres, estimated to yield a very considerable tonnage of exceptionally high grade stone, suitable for burnt lime, hydrated and agricultural purposes. Situated on Southern Railway in heart of Piedmont section of N. C., and approximately 200 miles from nearest lime quarry. For further particulars, address

P. O. Box 743 **Winston-Salem, N. C.**

Large Gravel Pit For Sale

Good quality. High price for all of output. Fine location for cement factory. Equipped with trackage. Good reason for selling. Address

Box 1339 **Care of Rock Products**

FOR SALE

One of the largest deposits of grayshale, limestone and gypsum in the U. S. Located in Mont., 9 miles from R. R. Can furnish gypsum in any quantity of highest grade, on cars. Address

J. D. PEMBLE
North Fork, Idaho

Plant Wanted

Wanted To Buy

Sand and Gravel Deposit. Give full particulars. Address

Box 1345 **Care of Rock Products**

You are reading this ad. So are others. That is why it will day you to advertise in these columns.

Help Wanted

WANTED

Draftsman familiar with cement and plaster mill practice to make installation drawings—some traveling. Give all particulars in answering.

BATES VALVE BAG COMPANY
7310 S. Chicago Ave. **Chicago, Ill.**

WANTED

Assistant Sales Manager for Eastern Lime Plant. State salary, experience and when can assume duties.

Box 1343 **Care of Rock Products**

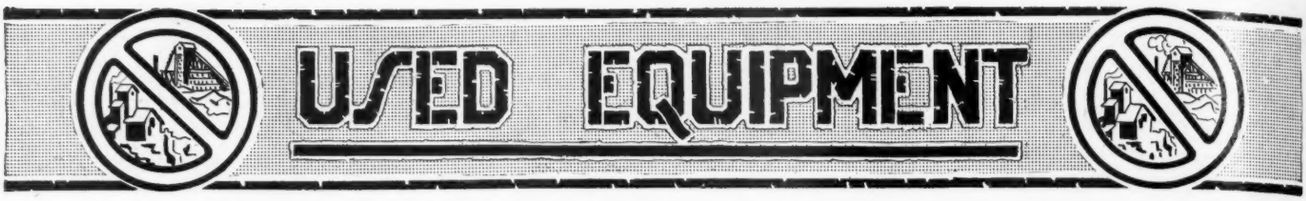
Positions Wanted

WANTED

Position as Manager or Superintendent of crushing plant and quarry. Thoroughly versed in the details of the business. Can produce, market the product, in fact, anything pertaining to the business generally. References on application. Open for engagement January 1, 1920.

Box 1346 **Care of Rock Products**

Prompt attention will be given your inquiry if you mention ROCK PRODUCTS



Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

STONE CRUSHERS

Need one, large or small? We are headquarters for good "used" machinery of this character. At present our holdings consist of nearly 100 different sizes—Gyratory Crushers from No. 2 to No. 21, Jaw Type from 8x14" to 60x84", also several Symons Disc and Crushing Rolls.

Let us know your requirements and you will hear from us by return mail. Inquiries also solicited for:

Locomotive Cranes, Steam Shovels, Locomotives, Cars, Rails, Hoists, Cableways, Compressors, Etc.

Wm. B. Grimshaw Co., 1048 Drexel Bldg., Phila., Pa.

Dealers in USED but NOT ABUSED Machinery

PRIVATE EQUIPMENT

Bucyrus Shovel, 65 ton, 2½ yd., on railroad trucks.
Bucyrus Shovel, steam traction, ½ yd. dipper.
Sturtevant Mill for pulverizing.
Locomotive, standard gauge, 35 ton.
20-ton standard gauge Shay Locomotive.
Duplex Compound Piston Pump, 3,000,000 gals. per day.
Milwaukee D. C. Generator, 8½ K. W., complete.
Tractor, Holt Caterpillar, 75 H. P.
Franklin Compressor, 530 ft., steam.
Drag line, caterpillar, ½ yd. dipper.
1800 ft. track, cars and locomotive, all 36" gauge.
6000 ft. track, cars and locomotives, all 24" gauge.
10 Western Dump Cars, 36" gauge, 4-yd.
10 ton steam roller, 3 wheel.
4 horizontal return tubular boilers, 72"x18', 150 H. P.

D. B. STRALEY, Crown Point, Ind.

FOR SALE

Four 36" Sturtevant Emery Mills.

CLIFFORD L. MILLER
280 Madison Ave., New York City

Contractors' Equipment

Of All Kinds

Here's a Special:

8—Brand New 7x10 American D. C. D. D. Hoisting Engines with butt-strapped Boilers.

Also a number of used hoists.

ZELNICKER IN ST. LOUIS

Get our new Bulletin No. 270. 60 pages of unusual values in Rails, Locomotives, Cars, Cranes, Boilers, Wire Rope, Hoists, etc.

FOR SALE

1 standard gauge, Porter saddle tank locomotive, cylinders 12x18.
1 Dragline Excavator, Monighan engines, locomotive boiler, 60-ft. boom, 2-yd. Paige Bucket.
1 Marion Railroad steam shovel, 1½-yd. dipper.

INTERSTATE SAND & GRAVEL CO.
Chamber of Commerce Bldg. Chicago, Ill.

FOR SALE

20—Crushers, Nos. 2 to 10, mostly Gates.
2—327 HP. W. T. boilers, 180 lbs. $9.50 HP
9—150 HP. 125-140 lb. HRT. boilers (B. strap).
1—No. 10K Gates Manganese fitted crusher.
1—No. 4 crushing plant, motor drive.
1—No. 3 crushing plant, engine drive.
1—No. 9K Gates Mang. fitted Rt. Angle dr.
2—48"x12' Taylor Manganese screens.
25—Air Compressors, 60 to 4000 cu. ft.
50—Steam engines, 30 to 1500 HP.
1—150 KW. 250 V. D. C. Steam Turbo. Non-Cond.
1—30 KW. 125 V. Crocker Wheeler Eng. Set.

Send us your inquiries for electrical equip., pumps, engines, hoists, cable.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

FOR SALE

CRUSHERS

2—48" Symons Disc Crushers

One practically new, the other used very little. Both in first-class condition. Full particulars on application.

BIRDSBORO STONE COMPANY
1004 Land Title Bldg., Philadelphia, Pa.

FOR SALE

60 H. P. Gas Engine

Bruce Mac Beth gas engine, 2-cylinder, speed 275, shop No. 373; in first-class running condition; will sell cheap. Have remodeled plant to use electricity throughout.

The Delaware Blue Limestone Contracting Co.
Delaware, Ohio

WANTED

2 No. 10 or No. 12 Gyratory Crushers, McCully or Gates preferred. Must be in good operating condition.

J. E. BAKER CO., YORK, PA.

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who'll keep it going.

To say you saw the ad in ROCK PRODUCTS gives tone to your inquiry